THE EFFECT OF SELECTIVE DISCUSSION ON YOUNG PEOPLE'S AUTOBIOGRAPHICAL MEMORIES

BY

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Abstract

Young people frequently talk about memories of experienced events with their parents and peers. These conversations are selective and little is known about the fate of memories that are not talked about. Retrieval-induced forgetting (RIF; Anderson, Bjork, & Bjork, 1994) is an experimental paradigm that can be used as a proxy for selective conversations under controlled conditions. While some studies have been conducted with adults (see Storm et al., 2015 for review), the impact of selective discussion on young people's recall of their autobiographical memories has not yet been investigated. This thesis, therefore, addresses a number of key gaps in the literature.

In the first study, we investigated the impact of selective discussion on 8-9-year-old children's ($N = 65$) recall of their autobiographical memories. Selective discussion produced RIF for children's positive and negative memories. Selective discussion also produced RIF for children's memory details; even when non-discussed memories were recalled, they were recalled in sparser detail. In addition, children who discussed a selection of their memories in more detail later forgot a greater proportion of their non-discussed memories. These findings are the first to demonstrate that selective discussion with children results in non-discussed memories being forgotten. Moreover, the findings indicate the importance of memory detail in RIF for autobiographical memories.

In the second study, we investigated the short and long-term impact of selective discussion on 13-15-year-old adolescents' ($N = 58$) recall of their autobiographical memories. After a short delay, selective discussion led to RIF for adolescents' negative memories only; RIF did not occur for adolescents' positive memories. After a long delay, RIF occurred for both positive and negative autobiographical memories. Given that Study 1 demonstrated that for children, RIF occurred for both positive and negative memories after a short delay, these findings with adolescents represent a novel developmental difference in RIF for

autobiographical memories with regard to memory valence. In addition, they suggest that RIF for different kinds of stimuli may occur over different delay periods.

In the third study, we expanded on the findings of Study 1, investigating the impact of selective discussion on specific kinds of autobiographical memory details for both children and adolescents (N = 123; combined sample from Study 1 and 2). RIF occurred for some memory details but did not occur for others. Moreover, the details of children's, as compared to adolescents', non-discussed autobiographical memories were more vulnerable to being forgotten following selective discussion. These findings again demonstrate a developmental difference in RIF for autobiographical memories and highlight the importance of investigating how selective discussion may impair non-discussed autobiographical memories even when they are recalled.

Overall, our findings extend the field by establishing that selective discussion about young people's everyday autobiographical memories results in non-discussed memories being forgotten. More specifically, we found developmental differences with regard to memory valence and detail that had previously been overlooked in developmental studies of RIF. Our findings add clarity about the specific types of memory detail that are vulnerable to being forgotten from non-discussed memories and highlight the necessity of investigating the long-term effects of selective discussion, even when RIF is not immediately evident.

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Structure of Thesis

This thesis is composed of a general introductory chapter (Chapter 1), a published article (Chapter 2), an article that is currently under review (Chapter 3), an unpublished empirical chapter (Chapter 4), and a general discussion chapter (Chapter 5). In order to maintain consistency between the three empirical chapters, Chapter 4 has been written in the style of a journal article. Repetition of information may occur across Chapter 1 and the introductions of the three empirical chapters, as well as across the methods of the three empirical chapters. In order to facilitate flow and cohesiveness across the thesis, transition pages have been inserted between each empirical chapter that link the articles. Although I was the lead investigator and author, I will use the term "we" when discussing material related to the empirical studies throughout the thesis.

Chapter 2 is the accepted version of the following article:

Glynn, R., Salmon, K., & Low, J. (2018). It's in the details: The role of selective discussion in forgetting of children's autobiographical memories. *Journal of Experimental Child Psychology, 167*, 117-127. DOI: 10.1016/j.jecp.2017.10.009

Chapter 3 is composed of a manuscript that is currently under review with the Journal of Experimental Child Psychology:

Glynn, R., Salmon, K., & Low, J. (2018). *Shorter and longer-term effects of selective discussion of adolescents' autobiographical memories.* Manuscript under review.

Statement of Authorship and Copyright

I am the lead investigator and author on the co-authored articles presented in this thesis. I developed the research questions, designed the studies, collected and managed the data, conducted and interpreted the analyses, and wrote the first drafts. Karen Salmon and Jason Low were involved in discussion about, and conceptualisation of, study design, research questions, and interpretation of analyses, and provided critical revisions of written drafts.

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Chapter 1

General Introduction

Talking and Not Talking about Autobiographical Memories

Memories of experienced events are regularly discussed in everyday conversations in many different contexts. Not every event experienced on any given day is reviewed in these conversations, however, resulting in selective discussion of some events at the expense of others. Conversation between parents and children about their memories of experienced events are one key way in which children's autobiographical memory skills are developed (Nelson & Fivush, 2004). Extensive research findings have documented the many benefits of talking about autobiographical memories throughout life (Bluck & Habermas, 2001), but particularly across childhood and adolescence (Fivush, Haden & Reese, 2006; McAdams & McLean, 2013; Salmon & Reese, 2016). Certain types of conversational styles have been identified as particularly beneficial for children's autobiographical memory development, for instance those that provide developmentally appropriate scaffolding, add new details, and are supportive of the child's perspective (Salmon & Reese, 2015). Much less is known, however, about the consequences of not talking about young people's memories. One possibility is that these memories will be forgotten and, depending on the content of the memories, this could negatively impact children's cognitive and emotional development (Salmon & Reese, 2015). This thesis is focused on the fate of those memories that are not talked about in selective conversations with young people. Specifically, we investigated the impact of talking about a selection of autobiographical memories at the expense of others, using an experimental paradigm to approximate the features of naturalistic conversations under controlled conditions.

In this chapter, I first describe the paradigm used to investigate the effects of selective discussion on recall and its theorised mechanism before discussing the paradigm in the

context of autobiographical memories. Since little research has been conducted with children's autobiographical memories, the majority of this section will be focused on findings with adults. In order to explore some discrepancies in the findings with adults, I also review findings on the positivity memory bias and suggest how this may impact the role of selective discussion for young people's autobiographical memories. I then review findings from studies that have investigated selective discussion with young people using stimuli other than positively- and negatively-valenced autobiographical memories. I outline the extent of the developmental effects found to date and highlight studies that have used stimuli that may be particularly pertinent to the current research. Next, I review findings on the duration of the effects of selective discussion with both children and adults, in order to establish some of the identified boundaries. Finally, I discuss the broader effects of selective discussion on the details of both children and adults' autobiographical memories, before outlining the overarching aim of this thesis and providing a brief description of each study conducted.

Retrieval-Induced Forgetting Paradigm

The retrieval-induced forgetting (RIF) paradigm can be used as an experimental proxy for selective conversation with children and young people. RIF refers to the finding that repeatedly retrieving a selection of memories at the expense of other similar memories results in a decrease in the ability to recall similar but non-practiced memories (Anderson et al., 1994). The original RIF paradigm used category-exemplar word pairs and consisted of three phases: a study phase, a retrieval practice phase and a test phase (see Figure 1). In the study phase, participants learned category-exemplar word pairs (e.g. Fruit-Apple). These included a number of different categories, with each category paired with multiple different exemplars (e.g. Fruit-Apple, Vehicle-Car, Fruit-Plum etc.). In the retrieval practice phase, participants practised retrieving half of the items from half of the categories via presentation of the category name and exemplar stem (e.g. Fruit-A_____). Each category-exemplar pair was

practised three times. After a delay interval of 20 minutes, participants were tested on their recall for all of the category-exemplar pairs learned in the study phase. They were cued with the category name and instructed to retrieve all the exemplars for that category.

Findings indicated that, of the categories that were included in the retrieval practice phase, recall of exemplars that were practised (RP+) was greater than recall of exemplars that were not practised (RP-). That rehearsal improves recall is not surprising and supports existing findings on the benefits of rehearsal for memory (Karpicke & Roediger, 2008; Reodiger & Butler, 2010). More importantly, however, recall of items from categories that were not included in the retrieval practice phase (NRP) was also greater than recall of RP- exemplars (Anderson et al., 1994). This suggests that the effects of forgetting are stronger for excluded items belonging to a category where some items are practised, than for items belonging to a category where no items are practised.

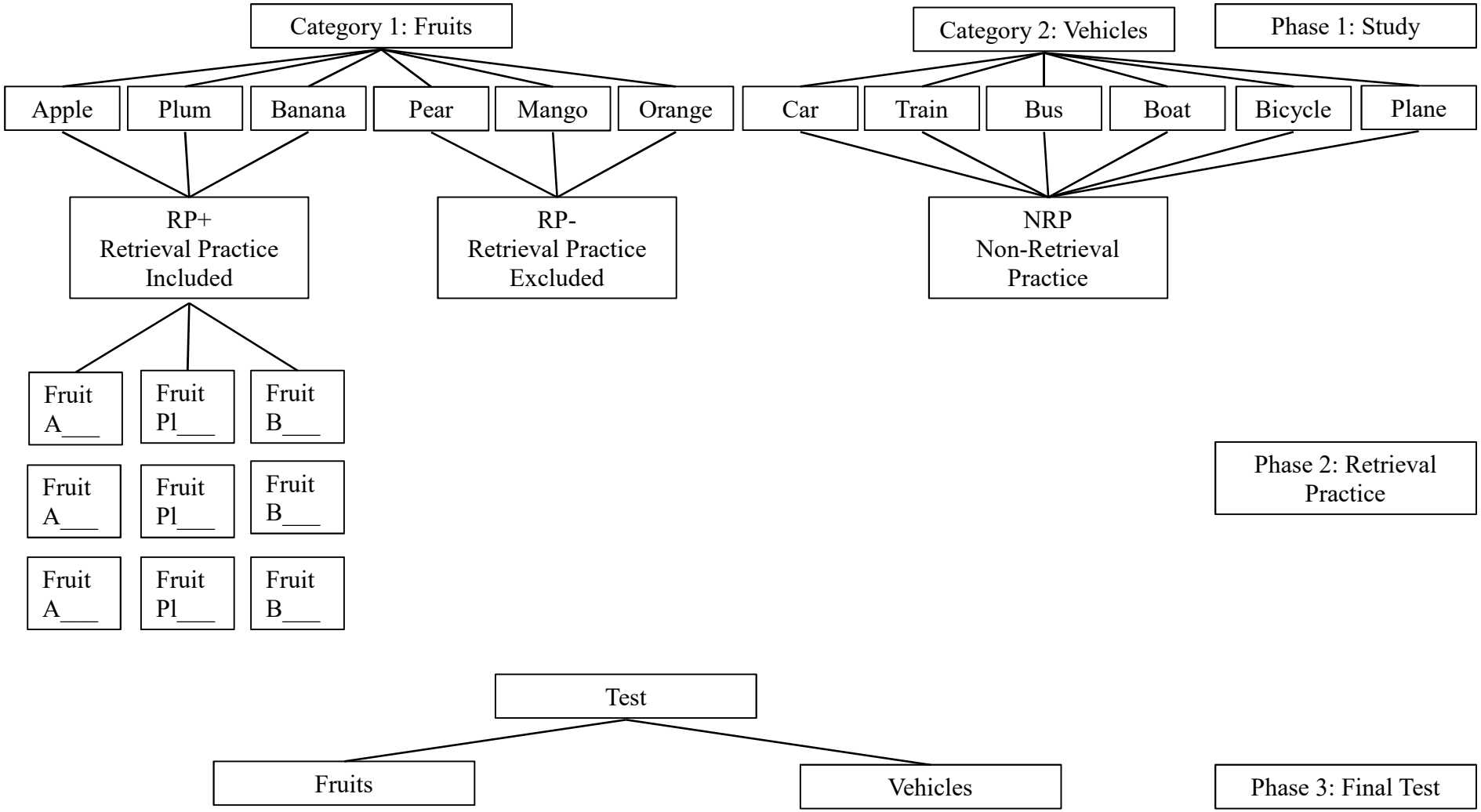

Figure 1. The 3 phases of Anderson et al.'s (1994) RIF paradigm. RIF occurs when recall for the NRP items is greater than recall for the RP- items.

Theories of RIF. Anderson et al. (1994) proposed a response-competition inhibition theoretical account of RIF in their initial study. According to this theory, items are in competition with each other during selective retrieval practice, and, in order to correctly retrieve RP+ items, RP- items must be inhibited. This selective inhibition leads to strengthened connections between the category cue and RP+ items and weakened connections between the category cue and RP- items. Subsequently, when presented with the category cue at the final test, the inhibited RP- items are harder to retrieve than NRP items, which were not inhibited during retrieval practice, leading to a reduction in the number of RP- items recalled, relative to NRP items. Since this initial RIF finding, a number of other theoretical accounts have been proposed, including competition-based accounts, which argue that competition between stimuli alone could produce RIF (e.g. Raaijmakers & Jakab, 2012) and context-based accounts, which highlight the role of context for memory (e.g. Jonker, Seli, & MacLeod, 2013). Although empirical findings have been both consistent and inconsistent with inhibition-based theories of RIF (see Storm et al., 2015 and Storm & Jobe, 2012 for reviews), Murayama, Miyatsu, Buchli, and Storm's (2014) meta-analytic review concluded that most of the findings to date support an inhibition account of RIF. Other theoretical accounts of RIF are therefore not discussed further in this thesis, as they are beyond the scope of the current investigation.

RIF for Autobiographical Memories

A number of studies have adapted the RIF procedure to investigate forgetting of adults' autobiographical memories (see Storm et al., 2015 for review). These memories are generated by the individual and are highly self-relevant (Stone, Luminet, & Hirst, 2013). Such procedures allow for investigation of both talking and not talking about people's past experiences on their future autobiographical memory recall. In these paradigms, retrieval categories are dictated by

valence, with either *positive* or *negative* memories used for retrieval practice, and its counterpart used as the non-retrieval practice comparison (NRP). Beyond this, RIF procedures have differed in a number of ways, including the cue words provided at the generation phase, whether written or oral accounts were generated, and the duration of the delay between retrieval practice and the final test (Barnier, Hung, & Conway, 2004; Harris, Sharman, Barnier, & Moulds, 2010; Wessel & Hauer, 2006). Despite these differences, RIF has been consistently found for autobiographical memories in adults, demonstrating the robust nature of RIF for autobiographical memory (e.g. Barnier et al., 2004; Harris et al., 2010; Stone et al., 2013; Wessel & Hauer, 2006).

Findings have differed, however, with regard to valence, with some studies finding RIF for both positive and negative memories (Barnier et al., 2004; Stone et al., 2013) and others finding RIF for negative memories only (García-Bajos & Migueles, 2017; Harris et al., 2010; Wessel & Hauer, 2006). Although the cause of this inconsistency remains unclear, García-Bajos and Migueles (2017) suggest that the memory generation procedure may be a contributing factor. The majority of studies that have found a RIF valence effect asked participants to generate autobiographical memories in response to the broad category cues of *"positive"* and *"negative"*, whereas most studies that have not found a valence effect used more specific emotionally-valenced cues, for example, *"horrified"* and *"entertaining"* (Barnier et al., 2004). It should be noted, however, that there are outliers to this trend, for instance, Stone et al. (2013) used "*positive*" and "*negative*" cues to generate participants' autobiographical memories and did not find a RIF valence effect. Moreover, García-Bajos and Migueles' (2017) explanation does not answer the question of why using broad category cues might protect positive autobiographical memories from being forgotten following selective discussion in a way that using more specific cues does not. Evidently, more research is needed to determine the factors that produce a RIF

valence effect for adults' autobiographical memories. Since these studies aim to approximate real-world conversation about experienced events, it is important to determine whether negative memories are uniquely vulnerable to forgetting following selective conversation or whether positive and negative memories are impacted alike.

Positivity Bias in Autobiographical Memory. In studies where a RIF valence effect has been found, the "positivity memory bias" has been implicated as a protective factor, reducing the likelihood that positive autobiographical memories will be forgotten following selective discussion (García-Bajos & Migueles, 2017; Harris et al., 2010). The positivity bias refers to a memory phenomenon whereby individuals are more motivated to recall positive personal memories than negative ones (Walker et al., 2003) and it is theorised to contribute towards the maintenance of positive mood states by influencing memory valence at both the encoding and storage stages of memory (Marsh, Edginton, Conway, & Loveday, 2018). Walker et al. (2003) suggest that two main factors are implicated in the positivity bias; first, as individuals are motivated to seek out positive experiences, they are more likely to encode neutral experiences as positive events and, second, the emotion associated with memories of negative experiences fades faster than those associated with memories of positive experiences, termed the "fading affect bias". In the context of RIF, it has been suggested that these factors uniquely protect non-discussed positive memories from being forgotten when a selection of positive memories are discussed (García-Bajos & Migueles, 2017; Harris et al., 2010).

Consistent with this theory, Storm and Jobe (2012) found that when adults were instructed to recall negative autobiographical memories, RIF magnitude was negatively correlated with the number of memories they recalled, such that adults who had higher rates of RIF recalled fewer negative autobiographical memories. In contrast, there was no correlation

between RIF magnitude and autobiographical memory recall when adults were instructed to recall positive autobiographical memories. This finding was replicated by Marsh et al., (2018), who used a free recall paradigm in which adults recalled autobiographical memories in response to a neutral cue word and then provided a self-report of memory valence. Following this procedure, RIF magnitude was associated with the ratio of negative to positive autobiographical memories recalled, such that adults with higher RIF magnitudes reported more positive relative to negative autobiographical memories. These findings support suggestions that adults' recall of negative autobiographical memories is more closely related to RIF than their recall of positive autobiographical memories.

Although some research has investigated the positivity bias across adulthood, finding that the effect is stronger in older adulthood than younger adulthood (Mather & Carstensen, 2005), no research has investigated the positivity autobiographical memory bias across childhood and adolescence. There is, however, some evidence to suggest that the memory valence bias may be flipped in infancy, with 1-2-year-old infants instead displaying a negativity memory bias, although this research is focused on infants' memory for discrete events rather than fully fledged autobiographical memory (Vaish, Grossmann, & Woodward, 2013; Van Bergen, Wall, & Salmon, 2015). Vaish et al. (2008) suggest that this negativity bias promotes survival in infancy, as children learn to appropriately avoid danger while exploring their environment. The positivity bias may, therefore, emerge over childhood and adolescence and continue to strengthen into adulthood. If this is the case, the RIF valence effect found with adults' autobiographical memories may not be found for the autobiographical memories of children and adolescents. Given the dearth of developmental research on this topic, however, it is difficult to determine the

developmental implications of the positivity memory bias as it pertains to young people's recall of their selectively discussed autobiographical memories.

Socially-Shared RIF. The influence of selective discussion on autobiographical memory recall has also been investigated in the context of social interactions, termed socially-shared retrieval-induced forgetting (SS-RIF) in contrast to traditional within-individual retrieval-induced forgetting (WI-RIF). In studies investigating SS-RIF, the RIF paradigm is extended to pairs of participants, whereby both take part in the study phase, but only one participates in the retrieval-practice phase while the other listens (Cuc, Koppel & Hirst, 2007). When category-exemplar word pairs are used as to-be-remembered stimuli, selective retrieval practice has produced both WI-RIF and SS-RIF (Cuc et al., 2007), indicating that selective discussion impacts the memory of both the speaker and the listener.

Increasing the ecological validity of RIF studies for conversations about autobiographical memories, Stone, Barnier, Sutton, and Hirst (2012) applied this paradigm in the context of adults' self-generated autobiographical memories, using both emotional and non-emotional autobiographical memories as well as free-flowing conversation about participants' autobiographical memories. In each condition, adults were either paired as strangers or intimate partners. Stone et al. (2012) found both WI-RIF and SS-RIF under every condition, indicating that selective discussion of adults' autobiographical memories impacts both the speaker's and the listener's ability to recall memories in future. The design of this study is potentially more akin to selective conversation about autobiographical memories in the real-world than studies that have only investigated WI-RIF for adults' autobiographical memories and is perhaps our best insight into how RIF may operate in naturalistic settings, in which silence about memories is as importance as speech (Stone, Coman, Brown, Koppel, & Hirst, 2012). Their findings indicate

that RIF occurs in free-flowing conversation between adults and affects not only the speaker but also the listener.

RIF with Young People

Studies with adults have demonstrated that RIF is a robust phenomenon; it has been found with a wide range of stimuli and over many varied conditions (see Murayama et al., 2014 for review). It should not be assumed, however, that RIF operates consistently across childhood, adolescence, and adulthood. Many neural, biological, and socio-cognitive changes occur over development that may influence cognitive process such as response-competition inhibition (Dahl et al., 2018). This may result in developmental differences in RIF and highlights the importance of investigating RIF for autobiographical memories across development.

RIF Across Development. Despite developmental findings indicating improvements in many cognitive abilities across childhood and adolescence (Ernst & Mueller, 2007; Steinberg, 2005), the majority of studies investigating RIF for category-exemplar word pairs with children as young as 5-years-old have not found any differences with age (see Murayama et al., 2014 for review). The absence of developmental changes in RIF has been explained by distinguishing between the processes of automatic or unintentional and controlled or intentional inhibition (Lechuga et al., 2006); while controlled inhibition is a skill that develops over childhood, the automatic inhibition implicated in RIF appears to be operational from at least 5-years-old, causing RIF to function the same way in childhood as it does in adulthood. Aslan and Bäuml (2010) propose that preschool-aged children mark a developmental limit to RIF, suggesting that children younger than approximately 5 years old may not have developed a sufficiently strong inhibitory system to produce RIF. In their study, 4-5-year-old children's recall of RP- items was only impaired when tested through free recall and not when tested through recognition, whereas

with both 7-8-year-old children and adults showed RIF when tested through both free recall and recognition. They suggest that for the youngest children in their study, forgetting was caused by retrieval interference, rather than inhibition. In sum, RIF studies using word pair stimuli with children indicate that from school-age onwards, there are no developmental differences in the impact of selective discussion on the likelihood of future recall of RP- stimuli.

RIF for Young People's Autobiographical Memory. To date, only Marche, Briere, and von Baeyer (2015) have investigated RIF for young people's autobiographical memories. Unlike studies investigating RIF for adults' autobiographical memories, however, their study focused on 7-15-year-old's pain-related memories only and investigated whether talking about positive aspects of these memories leads to forgetting of the negative aspects. In a departure from procedures used in most studies with adults, participants in their study only generated two autobiographical memories and both were about experiences of physical pain. Rather than using each memory as stimuli for RIF, their study used positively and negatively valenced aspects of a single memory as to-be-remembered stimuli. These aspects were categorised according to valence and only positive aspects were included in retrieval practice. Thus, positive aspects of the memory were RP+ items, negative aspects of the same memory were RP- items, and negative aspects of the second pain-related memory were NRP items. This procedure has also been used in studies investigating RIF in conversational settings (e.g. Stone, Barnier, Sutton, & Hirst, 2010). Marche et al. (2015) found RIF for the negative aspects of pain-related memories when positive aspects were discussed, that is, fewer negative aspects of pain-related memories were recalled when positive aspects of the memory were discussed, relative to the number of negative aspects that were recalled from the non-discussed memory.

Although Marche et al.'s (2015) findings indicate that young people show RIF for negative aspects of negative autobiographical memories, it is not possible to compare these findings with those found with adults due to the stark differences in the RIF procedures used. In addition, despite the wide age range of participants included in their study, they do not investigate the effect of development on RIF for aspects of autobiographical memories. Thus, although Marche et al.'s (2015) study can be broadly conceptualised as an investigation of RIF for young people's autobiographical memories, it is a unique use of the RIF paradigm and is therefore not comparable to findings with adults.

RIF for Children's Memory of Events. Although investigations of RIF for children's self-generated autobiographical memories are limited to one study (Marche et al., 2015), some studies have investigated RIF for children's memory of a staged event (Conroy & Salmon, 2005, 2006; Phenix & Price, 2012; Williams, Wright, & Freeman, 2002), thereby increasing the real-world applicability of RIF findings with children. In these studies, children first took part in a novel event before being asked questions about some aspects of the event, but not others. For instance, in Conroy and Salmon's (2005) study, 5-6-year-old children completed a number of unrelated activities with different objects, such as cutting paper into a triangle and folding a t-shirt. Half of the participants were then asked questions about half of the activities (RP+ items) and not questioned about the other half (RP- items). The remaining participants were not questioned about any of the activities and served as the NRP control group. Findings indicated that RIF occurred for non-reviewed activities; relative to the no-review control condition, children recalled significantly fewer non-reviewed activities when a selection of activities was reviewed. Using similar paradigms, these findings have been replicated with children of different ages participating in different novel events children, including 7- and 9-year-old's ability to

recall unrelated novel activities (Phenix & Price, 2012), and 5-6-year-old's ability to recall both activities involved in a baking themed staged event (Williams et al., 2002) and arbitrarily connected activities involved in a pirate-themed staged event (Conroy & Salmon, 2006). Thus, the findings to date indicate that selective discussion of both word pairs and more contextually-valid stimuli with children as young as 5-years-old produces RIF and, consistent with Marche et al.'s (2015) findings, suggest that selective discussion of children's self-generated autobiographical memories may also produce RIF for non-discussed memories.

RIF Duration

In contrast to the vast amount of research investigating the long-term effects of talking about autobiographical memories with young people (Fivush et al., 2006; Haden, Haine, & Reese, 1997; Salmon & Reese, 2016), very little research investigating the long-term effects of not talking about young people's autobiographical memories has been conducted. While the use of applied stimuli, such as autobiographical memories, as to-be-remembered stimuli in RIF investigations allows for greater understanding of how RIF may operate in the real world, a major limitation of the majority of RIF studies is that they are carried out in a single experimental session within 1 day. In order to further improve the ecological validity of RIF studies, the duration of the RIF effect must be established to determine whether RIF for autobiographical memory persists for longer than a single experimental session. To date, no research has investigated the impact of delay between retrieval practice and test on RIF for self-generated and emotionally-valenced autobiographical memories. Further, the duration of RIF has not been directly investigated for youth.

RIF Duration with Children. While no studies have experimentally manipulated the duration of the retention interval between the retrieval practice and test phases of the RIF

paradigm with children, some RIF studies with 5-9-year-old children have administered a memory test after a 1-day delay (Conroy & Salmon, 2005, 2006; Ford, Keating, & Patel, 2004). The combined findings of these studies suggest that RIF can endure over time, as they all found RIF following a delay of 24 hours between the final retrieval practice session and the final test (Conroy & Salmon, 2005, 2006; Ford et al., 2004). These findings may not be generalisable, however, as unlike the majority of RIF procedures, in which retrieval practice takes place in a single session, retrieval practice in these studies was spaced over multiple days. Given the memory-boosting effects of spaced review in comparison to massed review (Carpenter, Cepeda, Rohrer, Kang, & Pashler, 2012), it is possible that the RIF effect may not have endured as long if retrieval practice was massed in a single experimental session. These studies with children do demonstrate, however, that under certain conditions, RIF can persist for up to 24 hours following selective discussion with children as young as 4-years-old.

RIF Duration with Adults. Although the duration of RIF for adults' autobiographical memories has not been investigated, several studies have investigated RIF duration for adults with a variety of different stimuli, including, word pairs (e.g. Abel & Bäuml, 2012, 2014, MacLeod & Macrae, 2001; Saunders, Fernandes & Kosnes, 2009; Storm, Bjork, Bjork & Nestojko, 2006), staged events (e.g. García-Bajos, Migueles & Anderson, 2009; Migueles & García-Bajos, 2007), and written texts (e.g. Ortega, Gómez-Ariza, Morales, & Bajo, 2015; Saunders & MacLeod, 2002). While some did not find RIF at a delay of 24 hours (e.g. Abel & Bäuml, 2014; MacLeod & Macrae, 2001) other studies found evidence of RIF over time (e.g. García-Bajos et al., 2012; Ortega et al., 2015; Migueles & García-Bajos, 2007; Storm et al., 2006). Since the findings for RIF and delay appear so inconsistent (see Murayama et al., 2014 and Storm et al., 2015 for reviews), it could be that the duration of the RIF effect is influenced by

methodological factors, such as the nature of the to-be-remembered stimuli. In support of this notion, using an almost identical methodology, García-Bajos et al. (2009) found RIF after a 1-week delay with applied eyewitness stimuli, while Saunders et al. (2009) did not find RIF after a delay of just 24 hours using word-pair stimuli. One possible explanation for these inconsistent findings is that RIF may be more likely to endure over a delay when the stimuli used are more complex and have greater ecological validity. If this is the case, then we may expect findings for RIF for autobiographical memories to be similar to García-Bajos et al.'s (2009) findings and persist for longer than a single experimental session.

RIF for Memory Detail

Most RIF studies have investigated forgetting in terms of the number of memories recalled at the test phase; if fewer RP- than NRP memories are recalled, then RIF has occurred. While this is appropriate for the category-exemplar word pair stimuli for which the RIF paradigm was originally designed, use of more complex stimuli, such as autobiographical memories, may be impacted by selective discussion in ways that are not captured by the traditional conceptualisation of RIF. Autobiographical memories contain rich, detailed information about uniquely personal experiences (Fivush, 2008). In addition, they are typically structured as narratives, which convey an experienced event in context and include personal evaluations of the experience (Habermas & Reese, 2015). Selective discussion could, therefore, impair recall of RP- memories in many ways, even if they are recalled. Thus, most studies investigating RIF for autobiographical memories, in which RIF is conceptualised as the number of memories recalled, have merely scratched the surface of the potential impact of selective discussion. Only a small number of RIF studies have investigated the impact of selective discussion on memory details and each has conceptualised detail differently, making it difficult

to compare findings across studies. Since so few studies investigating RIF with children's autobiographical memory details have been conducted, we must primarily rely on findings with adults. Given the dramatic increase in both the quality and quantity of detail included in the autobiographical memories of adults in comparison to children (Habermas & Reese, 2015; Willoughby, Desrocher, Levine, & Rovet, 2012), however, it is also important to consider how selective discussion may impact autobiographical memory details at different developmental stages.

RIF for Adults' Autobiographical Memory Details. Despite the fundamental qualitative differences between word pair stimuli and autobiographical memories, only two studies have so far considered aspects of memory detail in their investigations of RIF for adults' autobiographical memory (Barnier et al., 2004; Wessel and Hauer, 2006). Moreover, Wessel and Hauer's (2006) study with adults is the only investigation of the effects of selective discussion on self-generated autobiographical memory details. In their study, adults were asked to generate specific memory details in response to the cues "*when*", "*where*", "*who*", and "*what*". They were again presented with these cues at the test phase of the RIF paradigm and asked to recall as many of their original memory details as possible. Memory detail was conceptualised as units of correctly recalled information, either 0, 0.5, or 1 for each cue, resulting in a total detail score ranging between 0-4 for each autobiographical memory. Using this conceptualisation of memory detail, Wessel and Hauer (2006) found that adults' RP- memories contained fewer of their original details than NRP memories, that is RIF occurred for adults' autobiographical memory details.

Taking a different approach, Barnier et al. (2004) investigated whether the amount of memory detail provided by adults' during the retrieval practice phase of the RIF paradigm was

associated with the number of memories recalled in each retrieval practice category (RP+, RP-, NRP) at the final test. In their study, memory detail was conceptualised using 3 indices; first, whether the memory was correctly retrieved; second, whether additional information was recalled; and third, whether interpersonal or emotional information was included. Barnier et al. (2006) found that memory detail during retrieval practice was not correlated with the number of memories recalled in any retrieval practice category, indicating that memory detail during selective discussion did not impact RIF.

Thus, findings with adults seem to indicate that selective discussion may impair recall of memory details at a later test, but that the amount of memory details provided during selective discussion does not impact adults' ability to recall their memories at a later test. That each of these studies used a different definition of memory detail is a limitation, however, as it is difficult to directly compare their findings; their contrasting findings could simply reflect differences in the memory detail measure. For instance, had Wessel and Hauer (2006) used Barnier et al.'s (2004) definition of memory detail, it is possible that they too would have found null results. In addition, these findings may not be directly applicable to young people, who are much less proficient than adults in constructing highly detailed autobiographical narratives (Reese et al., 2011; Willoughby et al., 2012). It is possible, therefore, that the interaction between memory detail and RIF may differ for young people and adults.

RIF for children's memory details. To date, only Conroy and Salmon's (2006) study has considered how selective discussion may impact children's recall of memory details in their investigation of RIF for 4-5-year-old children's memory of a staged pirate event. While children in their study did not generate personally relevant autobiographical memories, children's memories of a previously experienced staged event are more similar to autobiographical

memories than word pairs in terms of richness of detail. Like Wessel and Hauer (2004), Conroy and Salmon (2006) investigated whether selective discussion would influence children's recall of memory details during the test phase of the RIF paradigm. Conroy and Salmon (2006) used yet another measure of memory detail, however, conceptualising detail both as the percentage of correct actions and objects identified and the percentage of descriptors added. In their study, the connectedness of stimuli was also manipulated, such that some scenes were logically connected to one another and others were arbitrarily connected. Conroy and Salmon (2006) found that when scenes were arbitrarily connected, selective discussion led to RIF for memory details; children's RP- memories contained fewer memory details than their NRP memories. When scenes were logically connected, however, selective discussion did not produce RIF for children's memory details, supporting Anderson's (2003) theory that the connectedness of RIF stimuli buffers the inhibitory effect underpinning RIF. Importantly, their findings indicate that selective discussion with children about an experienced event can impair recall of non-discussed memories even when these memories are recalled. Given the similarity between memories for experienced staged events and self-generated autobiographical memories, these findings with children may indicate that, like with adults (Wessel & Hauer, 2006), selective discussion of children's self-generated autobiographical memories may impair recall of RP- memories even when they are recalled, such that they are recalled in less detail than NRP memories.

Conroy and Salmon's (2006) findings with children are consistent with Wessel and Hauer's (2006) findings with adults, with both studies finding that selective discussion impairs one's ability to recall detailed memories. It remains difficult to draw developmental conclusions from these findings, however, due to the many methodological differences between the two studies, including definitions of memory detail and the nature of the to-be-remembered stimuli.

Moreover, studies that have investigated the effect of selective discussion on memory detail have only conceptualised detail along one dimension, for instance, the number of previously reported details correctly recalled (Wessel & Hauer, 2006). The richness and complexity of autobiographical memories, however, provides opportunities to investigate RIF from many angles. Despite these limitations, findings with both children and adults indicate that selective discussion can impair memories even when RP- memories are recalled and should be investigated more thoroughly.

Autobiographical Memory Development. Although findings have suggested that there are no developmental differences in RIF from the age of 5-years-old (Aslan & Bäuml, 2010), conceptualising RIF as memory detail may uncover developmental differences that have previously been overlooked. Across childhood and into adolescence, the amount of both episodic and non-episodic information contained in autobiographical memories increases (Willoughby et al., 2012). In addition, young people's ability to construct a coherent narrative, one that effectively orients the listener to the context of the event and communicates the personal significance of the event, also improves across age (Habermas & Reese, 2015; Reese et al., 2011). It is, therefore, possible that the ways in which selective discussion impacts children's and adults' ability to recall the details of their non-discussed memories differ, and it may not appropriate to assume that children would resemble adults in this regard. Moreover, given that the biggest advancements in narrative skill development occur across childhood and adolescence (Habermas & Reese, 2015), differences in the way selective discussion affects the details of young people's memories may differ across this development period. Although the findings to date suggest that selective discussion impairs the quality of RP- memories, even when they are recalled, investigations with young people's autobiographical memories are lacking.

Current Research

The overarching aim of this thesis is to investigate the effect of selective discussion of young people's autobiographical memories on later recall of their discussed and non-discussed memories. In the following three studies, we investigated RIF for everyday positive and negative autobiographical memories with 8-9-year-old and 13-15-year-old young people, first establishing whether the RIF paradigm used with adults can be developmentally adapted and used with youth. Combining the two samples, we then considered some more nuanced aspects of RIF, namely the impact of selective discussion on non-discussed but recalled memories both within and between cohorts, and the longer-term effects of selective discussion beyond a single experimental session. We did not directly investigate RIF mechanisms, but given that the response-competition inhibition theory of RIF has received the most empirical support as an explanatory underlying mechanism of RIF (Murayama et al., 2014), we discuss our finding with reference to this theory throughout the thesis.

Study 1. The first study investigated RIF for positive and negative everyday autobiographical memories with 8-9-year-old children. At this age, children are able to communicate autobiographical memories as narratives (Reese et al., 2011), as is required for the paradigm. We aimed to address three key gaps in the literature. First, we investigated whether selective discussion with children would produce RIF for their similar, non-discussed memories. Although well established for adults (Storm et al., 2015) this is the first study to investigate RIF for children's self-generated positively and negatively valenced autobiographical memories. We adapted Stone et al.'s (2013) RIF procedure by reducing the number of memories generated by participants, in order to reduce the cognitive load of the task while maintaining an open memory generation process. Both positively- and negatively-valenced memories were generated by

participants and the design was counterbalanced such that both were included in selective retrieval-practice. Since this was the first study to investigate RIF for children's autobiographical memories using a similar paradigm that has been used with adults, our findings can be more directly compared with findings with adults. In addition, the RIF paradigm utilised in this study more closely resembles real-world conversations than any RIF paradigm used with children previously.

Second, we investigated whether selective discussion would impair children's recall of memory details for similar non-discussed memories that are recalled. Given the complexity and richness of autobiographical memories, it is possible that selective discussion impairs the quality of memories even when they are recalled. To date, this has only been investigated in one study with adults' autobiographical memories (Wessel & Hauer, 2006) and one study with children's memories of a staged event (Conroy & Salmon, 2006), with both studies finding impairment in non-discussed but recalled autobiographical memories. Since these studies each used a different measure of memory detail, making it difficult to compare findings across studies, we opted to broadly define memory detail as total meaningful words. This definition serves as a sensitive measure of memory detail that may be particularly appropriate for use with children, whose memories typically contain fewer details than adults (Fivush et al., 2006). Third, we investigated whether memory detail provided by children during the retrieval practice of the RIF paradigm is related to RIF magnitude at the test phase. As such, we investigated the interaction between memory detail and selective discussion in two ways; first, we asked does selective discussion produce RIF of memory details and, second, does the amount of memory detail provided during selective discussion impact the magnitude of RIF?

Study 2. The second study investigated RIF for everyday positive and negative memories with 13-15-year-old adolescents, after both a short and longer delay. This age group was selected as between early- to mid-adolescence, young people begin to communicate their autobiographical memories in ways that imbue a sense of personal meaning and define the self as an individual (Habermas & Reese, 2015). In order to increase the real-world validity of RIF findings, it was important to establish whether the RIF effect is an experimentally-bound phenomenon or whether selective discussion may have longer lasting effects on young people's ability to recall their memories. Using the RIF paradigm developed for Study 1, we investigated the impact of selective discussion on adolescents' autobiographical memory recall after a 5-minute delay and, in addition, we administered a follow-up recall test 1 day after the initial session.

Study 2 had two main aims. First, we investigated whether selective discussion of adolescents' positive and negative autobiographical memories would result in RIF after a delay of 5 minutes. Unlike many findings with adults (Storm et al., 2015), the findings of Study 1 indicated that children did not show a RIF valence effect; RIF was found for both positive and negative autobiographical memories. As such, we were specifically interested in whether selective discussion with adolescents would result in RIF for both positive and negative memories, or whether a RIF valence effect would emerge. The second aim of our study was to investigate whether the impact of selective discussion would persist beyond a single experimental session. This enabled us to draw conclusions about how the inhibition implicated in selective discussion may operate over time.

Study 3. The third study investigated the ways in which selective discussion may impair young people's non-discussed but recalled (RP-) autobiographical memories. Building on Study

1, which used a broad and encompassing measure of memory detail, this study aimed to specify the kinds of details forgotten from young people's non-discussed but recalled memories. As such, two indices of memory detail were used; narrative coherence (Reese et al., 2011) and episodic and non-episodic detail (Addis et al., 2008). The first aim, therefore, was to investigate whether selective discussion impacted either the narrative coherence or the episodic and non-episodic detail reported in young people's memories. Thus, rather than conceptualising RIF as the presence or absence of a memory at the test phase, RIF was conceptualised as the extent of narrative coherence and amount of episodic and non-episodic details contained in recalled RP- memories at the final test.

Since both the quality and quantity of information contained in autobiographical memories increases across development (Reese et al., 2011; Willoughby et al., 2012), our second aim was to investigate whether the impact of selective discussion on memory detail would differ for 8-9-year-olds and 13-15-year-olds. Although developmental studies have concluded that the RIF effect consistently occurs for children as young as 5-years-old up to adulthood (Aslan & Bäuml, 2010), conceptualising RIF as memory detail may expose new developmental RIF findings. Thus, this study expands on previous RIF studies by investigating the fate of non-discussed memories, even when they are recalled.

Chapter 2

Study 1: It's in the details: The role of selective discussion in forgetting of children's autobiographical memories

This chapter is composed of a published manuscript with the following citation:

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Abstract

This experiment investigated whether retrieval-induced forgetting (RIF) would be found in children's self-generated autobiographical memory recall. An adapted version of the RIF paradigm for adults' autobiographical memories was administered to 8-9-year-old children (N = 65). We hypothesized that RIF would be found both in terms of number of memories recalled and amount of memory detail reported. The relationship between memory detail at the retrieval-practice phase and RIF magnitude was also investigated. Consistent with hypotheses, RIF was found for both the number of memories recalled and the amount of memory detail reported. In addition, memory detail at retrieval-practice was associated with increased RIF magnitude. Findings extend the current literature in three ways. First, they indicate that selective discussion of autobiographical events with children can cause forgetting of similar, non-discussed events; second, even when these non-discussed events are recalled, they contain sparser memory detail; and finally, when events are selectively discussed in greater detail, forgetting of similar, non-discussed events occurs to a greater extent.

Introduction

Conversation about past experiences in the context of parent-child interactions promotes autobiographical memory development (Salmon & Reese, 2016). Yet the selective nature of conversation about the past inevitably results in some details being omitted from discussion. Much of the literature has focused on how aspects of conversation between parents and children influence how children come to recall their everyday experiences (Fivush, Haden, & Reese, 2006; Wareham & Salmon, 2006). Much less is known about the impact of selective discussion on children's memory for the information that was not discussed, however (Salmon & Reese, 2015). The current study focuses on these non-discussed autobiographical event details, and investigates how conversation shapes what is forgotten rather than what is recalled.

The Retrieval-Induced Forgetting (RIF) paradigm is an experimental proxy for conversation, allowing investigation, under conditions of experimental control, of the impact of non-discussed information on later recall (Anderson, Bjork, & Bjork, 1994). RIF refers to the finding that retrieving a selection of memories at the expense of other, similar memories results in a decreased ability to recall those non-practiced memories, relative to memories that were never discussed (Anderson et al., 1994). The original RIF paradigm uses category-exemplar word pairs (e.g. Fruit-Apple, Fruit-Orange, Vehicle-Car), whereby participants practice retrieving some learned word pairs (Fruit-Apple, termed RP+) but not others from the same category (e.g., Fruit-Orange, termed RP-). Some categories are not practiced at all (e.g., Vehicle-Car, termed NRP). Participants are then cued with each category name and instructed to retrieve all the exemplars from that category. Typically, a facilitation effect is found for RP+ exemplars, such that recall is greater for these items than RP- and NRP items. Surprisingly, however, a forgetting effect is also found, such that recall of RP- items is poorer than recall of NRP items

(Anderson et al., 1994). This suggests that recall is poorer for non-practiced items belonging to a category of which some items are practiced relative to items belonging to a category of which no items are practiced.

While the RIF effect has been found to be relatively robust across different stimuli and testing conditions (Murayama, Miyatsu, Buchli, & Storm, 2014), some boundary conditions have been identified, signaling that RIF is not inevitable in every situation. Since Anderson et al.'s (1994) initial findings, the RIF paradigm has been applied to a number of contexts, including eye-witness testimonies and educational settings (see Storm et al., 2015 for review). In most cases, selective retrieval of a range of stimuli has resulted in forgetting of the non-practiced material, although the magnitude of RIF is often reduced for more real world stimuli in comparison to word pairs (Murayama et al., 2014).

The major theoretical explanation for RIF, a response-competition inhibition account, may explain this difference in magnitude. According to this account (Anderson et al., 1994), presentation of a category cue produces competition between RP+ and RP- items and in order to respond correctly during the retrieval practice phase, RP- items must be inhibited to facilitate correct recall of RP+ items. This inhibition results in poorer recall of RP- than NRP items at the test phase. In cases where the to-be-remembered stimuli are too strongly integrated, however, the RIF effect can be diminished or even eliminated (Anderson & McCulloch, 1999). This integration may weaken the inhibitory effect of selective retrieval practice on recall of RP- items. The integration serves to reduce competition between stimuli, and rather than selectively targeting RP+ items, retrieval practice also triggers activation of RP- memories (Anderson, 2003). The reduced RIF magnitudes observed for real world RIF paradigms suggests a reduction in competition between stimuli and, therefore, decreased inhibition of RP- items.

Strengthening the applicability of the findings from this paradigm to real world settings, recent research with adults has demonstrated RIF for autobiographical memories (Barnier, Hung, & Conway, 2004; Stone, Luminet, & Hirst, 2013; Wessel & Hauer, 2006). These studies have adapted the RIF paradigm in a way that more accurately mirrors conversation, whereby multiple autobiographical memories, both positively and negatively valenced, are generated (see Storm et al., 2015 for review). Despite some variations in methodology, these studies have consistently demonstrated RIF of non-discussed autobiographical memories. Findings have been mixed regarding valence, however, with some studies only finding RIF for negative memories (Harris, Sharman, Barnier, & Moulds, 2010; Wessel & Hauer, 2006) and some for both valences (Barnier et al., 2004; Stone et al., 2013). Harris et al., (2010) suggest that positive memories may be exempt from RIF due to a positive memory bias; individuals have greater motivation to recall positive memories, thereby reducing the efficacy of selective retrieval practice for positive autobiographical memories. Since the effect of memory valence on RIF is unclear, it should continue to be investigated in studies of RIF for autobiographical memories.

In contrast to the research with adults, there is only a small amount of work with children. Some of these studies have used category-exemplar word pairs (Aslan & Bäuml, 2010; Lechuga, Moreno, Pelegrina, Gómez-Ariza, & Bajo, 2006), but others have adopted more engaging and ecologically-valid novel procedures, using staged events as stimuli and conversation as the retrieval mode (Conroy & Salmon, 2006; Ford, Keating, & Patel, 2004; Williams, Wright, & Freeman, 2002). These studies show that children from as young as 4 years of age demonstrate RIF to a similar extent as adults (Aslan & Bäuml, 2010). Despite these findings using staged events, almost no research with children has investigated RIF for autobiographical memories; these memories differ from recall of staged events as they are self-generated and are, therefore,

personally relevant. Thus investigating the impact of selective discussion on self-generated autobiographical memories further increases the applicability of the RIF paradigm to the real world, where the speaker often self-selects topics of conversation.

The one study to date to investigate RIF for children's autobiographical memories (Marche, Briere, & Von Baeyer, 2016) has yielded suggestive findings, in that conversation with 7-15 year old children about the positive aspects of a painful event caused forgetting of the negative aspects of that event relative to a non-discussed event. This study focused on one event only, with a second event as a control. In daily life, however, there will inevitably be instances where multiple experiences are discussed at the expense of others. Of course, one reason is that it is simply not possible for parents to discuss all experiences with their children, but other times this may be motivated by the desire of an adult to minimize their child's distress about stressful experiences or even to subvert a child's understanding and memory of their experiences (Salmon & Reese, 2015). Although children display RIF for simple word pair stimuli and even more complex novel event information, utilizing self-generated and personally relevant autobiographical memories as to-be-remembered stimuli may mark another boundary condition for the effects of RIF. Thus, it is timely to extend the RIF autobiographical memory paradigm developed for use with adults (e.g. Barnier et al., 2004) to children, in order to examine whether selective discussion of autobiographical memories with children yield similar patterns as with adults.

A second benefit of focusing on autobiographical memories is that it enables novel ways of investigating the RIF effect. While the RIF paradigm has been adapted in a variety of ways for use in real-world contexts (Storm et al., 2015), the method of calculating RIF has remained largely unchanged since Anderson et al.'s (1994) original design. The difference in the qualities

of an autobiographical narrative and a category-exemplar word stem, however, are stark. In order to investigate how RIF may manifest in these complex narratives, a broader RIF conceptualization may be required. For instance, RP- memories that are successfully recalled at the test phase may be lacking substantially more of their original detail than NRP memories, which is not accounted for in a traditional RIF conceptualization.

Studies with both adults' autobiographical memories (Wessel & Hauer, 2006) and children's memories for novel events (Conroy & Salmon, 2006) have attempted to address this issue by including a measure of reported detail in RIF analyses. Despite measuring detail differently, both studies found RIF for memory detail; RP- memories contain less detail than NRP memories. So far, analyses of RIF for memory detail have been constrained by the total number of details that participants are able to report. For instance, in Conroy & Salmon's (2006) study, children were scored on the proportion of correct information they remembered from the total number available in each scene, and in Wessel & Hauer's (2006) study, participants were scored from 0 to 5 for each piece of correctly recalled information in response to the cues *when*, *where*, *who*, and *what.* Constraining memory detail in this way for the purpose of investigating children's autobiographical memories could result in a truncation of variance, as children's narratives are typically shorter and contain fewer details than those of adults (Fivush et al., 2006). In addition, narratives with greater detail in each dimension are not distinguished from narratives with sparse detail, and details such as descriptive embellishments and emotional interpretations are overlooked. Broader conceptualizations that measure detail on a continuous scale may, therefore, be more appropriate for use with children's autobiographical memories.

Variability in children's memory detail at the retrieval practice phase may also be associated with the magnitude of forgetting found. There is debate in the literature as to whether

altering the strength of RP+ items influences the extent of forgetting for RP- items. While some studies have concluded that increasing the strength of RP+ items at retrieval practice does not impact RIF (Anderson et al., 1994; Anderson, Bjork, & Bjork, 2000; Conroy & Salmon, 2006) or may even reduce RIF (Campbell & Phenix, 2009; Storm, Bjork, Bjork, & Nestojko, 2006), other findings suggest that retrieval practice strategies that increase the strength of RP+ items produce increases in RIF magnitudes (Bäuml, 2002; García-Bajos, Migueles, & Anderson, 2009). Adopting a neural network learning algorithm, Norman, Newman, and Detre (2007) found that RP+ strength during retrieval practice has a nonmonotonic effect on RIF magnitude; strengthening RP+ items increases RIF to a peak level, then further increases in RP+ strength serve to decrease RIF. They propose that increasing RP+ strength reduces competitor activation up to a peak level, making RP- items less likely to be later recalled, but further increases in RP+ strength increases competitor activation again, making RP- items more likely to be later recalled. As their theory stands, it is consistent with competition-based blocking accounts of RIF, which state that RIF occurs simply because RP+ memories are strengthened during retrieval practice, in turn weakening RP- memories and making them more susceptible to forgetting (Storm et al., 2015). As proposed by Storm and Levy (2012), it is also possible to incorporate inhibition into Norman et al.'s (2007) theory, making it consistent with inhibition accounts of RIF. In this case, increases in RP+ strength would lead to increases in the level of inhibition required to suppress RP- items, resulting in the changes in RIF magnitude. The complex interaction between RP+ strength during retrieval practice and RIF magnitude may explain the current inconsistency in the literature.

In the context of RIF for autobiographical memory, memories reported with greater detail during the retrieval practice phase may be more strongly connected to the category cue than

memories with less detail. These highly detailed memories could be more strongly encoded, increasing their memorability relative to less detailed memories. Thus, highly detailed RP+ memories could serve to either increase or decrease RIF magnitude (Norman et al., 2007). To date, only Barnier et al. (2004) have investigated the association between memory detail and RIF magnitude with respect to autobiographical memory in the context of research with adults**.** This study scored memory detail at retrieval practice on a three-point scale according to the extent of additional detail included. Although they found no relationship between detail and RIF magnitude, a conceptualization of detail as continuous may increase sensitivity to variability in memory detail and the influence on RIF magnitude.

The Current Study

Although the RIF paradigm has been successfully adapted for use with children in some contexts, the adapted RIF paradigm for autobiographical memories utilized with adults has not yet been tested with children. The first aim was to investigate whether children also manifest RIF for self-generated and personally relevant autobiographical memories. A developmentally appropriate adapted version of Stone et al. (2013) RIF paradigm was administered to 8-9 year-old children. This age group was selected as children would be able to produce autobiographical narratives of sufficient length (Reese et al., 2011) and sustain attention on the task. In this paradigm memories are produced by participants in the generation phase, selective discussion takes place during the retrieval practice phase and recall is assessed at the test phase.

We hypothesized that children would demonstrate the same patterns of forgetting of autobiographical memories as displayed by adults; fewer RP- memories would be recalled by children following selective discussion than NRP memories. Given the mixed findings in the literature regarding valence (see Storm et al., 2015 for review), we did not make a specific

hypothesis for valence effects, but tested these in our analyses. The second aim was to establish whether RIF would be found for reported memory details. We hypothesized that children would display RIF for memory detail; even when RP- memories are recalled at the test phase, they would contain less of their original detail than NRP memories. Our third aim was to investigate the association between memory detail at retrieval practice and RIF magnitude. Since the relationship between RP+ strength and RIF magnitude appears to be complex (Norman et al., 2007) and current findings are inconsistent, we did not make a specific hypothesis. Figure 2 displays our hypotheses organized by the RIF paradigm phases.

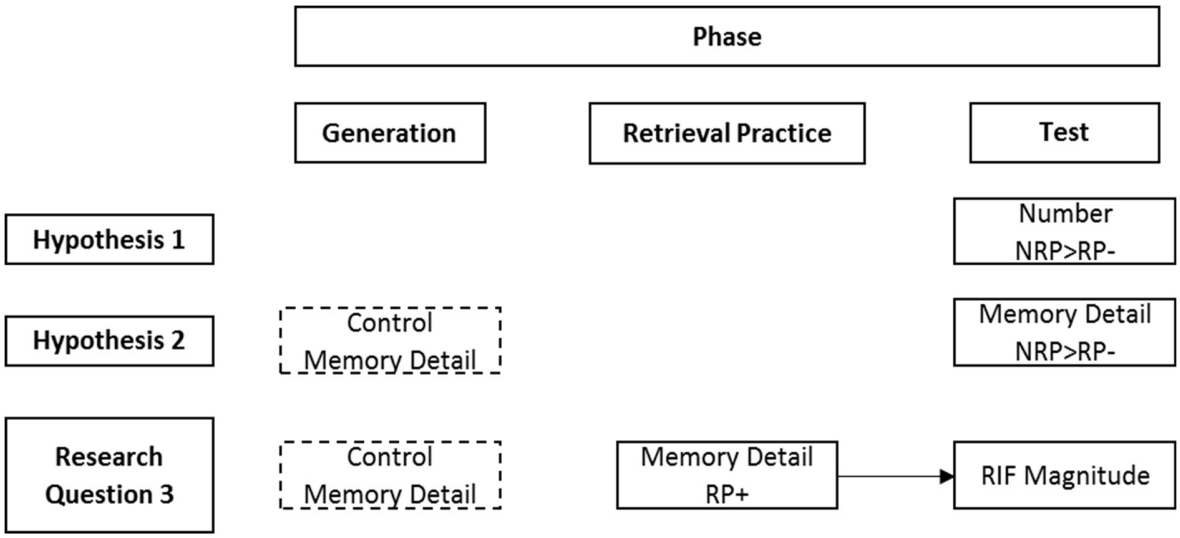

Figure 2. Hypotheses depicted at the relevant stages of the RIF procedure. Hypothesis 1 predicts that recall for NRP items will be greater than RP- items at the test phase. Hypothesis 2 predicts that there will be more memory detail in NRP items than in RP- items at the test phase, while controlling for memory detail at the generation phase. Research question 3 investigates the link between memory detail in RP+ items at the retrieval practice phase and RIF magnitude at the test phase while controlling for memory detail at the generation phase.

Method

Participants. The initial sample consisted of 69 participants, of whom 4 were excluded

due to inability to recall the correct memories during the retrieval practice phase (see Materials and Procedure for further detail). The final sample was 65 children between 8 and 9 years of age (M = 9.13 years, SD = 0.05 years), of whom 36 were female and 75.4% identified as European (9.2% Asian, 4.6% Maori, 10.8% Other). Children were recruited from four schools (deciles 7-10) in New Plymouth, New Zealand. Informed consent was obtained from participants' parents or guardians and children gave verbal assent before the procedure began.

Materials and Procedure. An adapted version of Stone et al.'s (2013) RIF paradigm for autobiographical memory was utilized. The duration of the procedure varied between 30-50 minutes and was divided into five phases: *generation, learning, retrieval practice, distractor,* and *test.* Children did not show signs of fatigue and all stayed for the duration of the procedure, despite being informed they could leave at any time.

Generation. Participants were asked to generate 12 autobiographical memories in response to the cue words *positive* and *negative*, 6 memories for each cue. In order to minimize participant demand characteristics, participants were informed, "there are no right or wrong answers" and that we were simply interested in "how children remember things that have happened to them". The cue words were read aloud by the researcher; participants began by generating a positive memory, then cues were alternated. Participants were not given a time limit to generate their 12 memories and received a standardized prompt to provide more information for each memory. Examples of positive memories generated include winning competitions, attending birthday parties, and receiving gifts. Examples of negative memories generated include arguing with friends, getting told off by parents or teachers and physical injuries (e.g. broken bones). Responses were audio recorded and memory details were written down by the researcher to be read back to the child in the learning phase. Participants were also asked to rate the valence

of each memory (1 = *very positive*, 5 = *very negative*) and to generate a title for each memory. For example, the cue word *positive* could elicit the memory, *"When I went to my friend's birthday party at the weekend"*, and the title could be *"Birthday"*.

Learning. Each triad was read aloud by the researcher so that participants could learn the connection between the cue word – title – autobiographical memory triad. For instance, the triad for the above example is: *Positive – Birthday - "When I went to my friend's birthday party at the weekend"*. Triads were read in the same order as they were generated, starting with the first positive memory followed by the first negative memory and so on, alternating between positive and negative memories.

Retrieval Practice. During this phase, the researcher read aloud the cue word and memory title (e.g. *Positive – Birthday*) for either 3 negative or 3 positive memories, and participants were asked to recall the correct autobiographical memory from the triad. Four participants, who were unable to recall the corresponding memory, were excluded from analyses. Memories selected for this phase were the RP+ memories, while memories from the same valence category not included in retrieval practice were the RP- memories. None of the memories from the remaining valence category were included in retrieval practice and were NRP memories. In order to maximize memory detail reported and minimize interviewer effects, participants were prompted to recall each memory in as much detail as in the generation phase. The selection of memories was counterbalanced for each condition, such that participants either retrieved the first 3 positive/negative memories, or the second 3 positive/negative memories. Each of the 3 memories were retrieved 3 times in a random order, such that the same memory was not directly repeated. Participants were instructed to recall the memory in as much detail as possible and were asked about the causes, consequences and importance of the event over the 3

retrievals of each memory (Harris et al., 2010), for the purpose of encouraging active engagement with the recall task.

Distraction. Participants then completed a distractor task for 5 minutes. They were required to copy drawings of animals from one grid to another. If participants completed a drawing within 5 minutes they were given additional pictures to complete to fill 5 minutes.

Test. Finally, participants were presented with the cue words *positive* and *negative* and asked to recall as many of their 12 memories from the generation phase as possible. Again, participants were asked to recall their memories in as much detail as in the generation phase. Whether participants first recalled positive or negative memories was counterbalanced across participants and recall for each cue continued until participants could not remember any more memories. Participants were then debriefed and given a small gift to thank them for participation.

Coding. Memory detail was defined as meaningful content, measured as total words contained in a narrative once repetitions and filler words (e.g. 'um', 'like') were removed. This conceptualization of length is more sensitive to subtle differences in detail than definitions previously used with RIF research (Conroy & Salmon, 2006; Wessel & Hauer, 2006). This is particularly pertinent in order to avoid ceiling effects with children's shorter narratives. Intra-class correlations (ICC) for number of meaningful words, calculated following independent coding on 25% of the narratives, was .89.

Results

Generation

All participants generated 12 memories during the generation phase; 6 to the cue word 'positive' and 6 to the cue word 'negative'. Participants rated the emotional valence (1 = *very positive*, 3 = *neither positive nor negative*, 5 = *very negative*) of each memory. A paired samples

t-test indicated that participants rated positive memories (M = 1.51, SD = 0.65) as significantly more positive than negative memories (M = 3.99, SD = 0.45), $t(64) = 22.81$, $p < .001$, 95% CI [-2.70, -2.26].

Final test

Memories at the test phase were scored as correct if they contained sufficient detail to be unambiguously matched to a memory at the generation phase. Since the data were not normally distributed, bootstrapping was performed on all analyses where appropriate. In order to test for valence order effects in the test phase, a 2 (Valence: positive, negative) x 2 (Recall Order: positive first, negative first) x 3 (RP Category: RP+, RP-, NRP) mixed model ANOVA was conducted. There were no significant interactions for recall order, indicating that whether positive or negative memories were recalled first had no impact on RIF (Fs range: 0.46 - 0.55, ps range: .64 - .58). In order to test for age and gender effects, two separate mixed model ANOVAs were conducted, as above. There were no significant interactions for either age (Fs range: 1.45 – 1.47, ps range: .31 - .33) or gender (Fs range: 1.55 – 0.07, ps range: .19 - .93). Table 1 presents the mean percentage of memories correctly recalled for each of the RP categories.

RIF

To test the first hypothesis, that children will display RIF for autobiographical memories, a 3 (RP Category: RP+, RP-, NRP) x 2 (Valence: positive, negative) mixed model ANOVA was conducted. There was a significant main effect of RP category, $F(2, 126) = 27.12$, $p < .001$, $\eta 2$ = .30, but the interaction between RP category and valence was not significant, indicating no valence effects. Planned t-tests revealed a facilitation effect, such that recall of RP+ memories was significantly greater than recall of both RP- memories, $t(64) = 5.79$, $p < .001$, 95% CI [0.21, 0.43], and NRP memories, $t(64) = 6.19$, $p < .001$, 95% CI [0.16, 0.31]. Additionally, in support of

the first hypothesis, there was a forgetting effect, such that recall of NRP memories was significantly greater than recall of RP- memories, $t(64) = 2.06$, $p = .04$, 95% CI [-0.17, 0.00].

As output interference was a possible explanation for these findings, Macrae and Roseveare's (2002) procedure for ranking recall order was utilized to investigate output order effects (see also Barnier et al., 2004; Stone et al., 2013; Wessel & Hauer, 2006). As RP+ memories are more likely to be recalled earlier during free recall, this analysis establishes whether omission of RP- memories at the test phase is due to RIF or to output interference. First, memories at the test phase were ranked according to recall position, with the first memory recalled being given a rank of 1, the second a rank of 2 and so on. We then calculated the mean recall position for RP+ ($M = 2.28$, $SD = 0.63$) and RP- ($M = 3.11$, $SD = .92$) memories. Twelve participants were removed from this analysis as they recalled either no RP+ memories or no RP- memories at the test phase, so means could not be calculated. Average recall position of RP- memories was subtracted from RP+ memories and a median split of the difference score was conducted to create an 'early RP+' group ($n = 29$) and an 'early RP-' group ($n = 24$). A 3 (RP Category: RP+, RP-, NRP) x 2 (Valence: positive, negative) x 2 (Output Order: early RP+, early RP-) mixed model ANOVA was conducted and neither the main effect of output order nor the interaction of output order and RP category were significant (respective Fs: 0.51, 2.40, respective ps: .48, .10). The results indicate that the RIF effect is unlikely to be due to output interference at the final test.

Memory Detail Calculation

For each participant, a mean memory detail score was calculated for the generation and test phases for each of the RP categories. In the test phase, the mean score was calculated by dividing the sum of the memory detail in a given RP category by the number of memories

identified as correctly recalled in that category. For example, if a participant recalled 2 RP+ memories, the sum of their memory detail in RP+ memories would be divided by 2. Mean memory detail for generation and test, broken down by RP category, is also reported in Table 1. Mean detail for each participant was also calculated for narratives in the retrieval practice phase (M = 49.19, SD = 30.59).

RP Category	Proportion Recalled		Memory Detail	
	M	*SD*	*M*	*SD*
		Generation		
RP+	-	-	53.00	39.93
RP-	-	-	49.82	32.06
NRP	-	-	52.30	34.91
		Test		
RP+	0.82	0.26	37.27	47.54
RP-	0.50	0.32	22.45	29.72
NRP	0.58	0.22	36.60	30.16

Table 1. Descriptive statistics for proportion of memories correctly recalled in the test phase and amount of memory detail in generation and test phase.

Memory Detail RIF

To test the second hypothesis, that RIF would be displayed in narrative detail, a 3 (RP category: RP+, RP-, NRP) x 2 (Valence: positive, negative) x 2 (Phase: generation, test) mixed model ANOVA was conducted. There were significant main effects of RP category $F(2, 126) = 6.56$, $p = .002$, $\eta 2 = .09$, and phase, $F(1, 63) = 21.87$, $p < .001$, $\eta 2 = .26$, but the interactions between valence and RP category, and phase and RP category were not significant (Fs < 6.56, ps

< .29). All narratives were significantly less detailed at the test phase than the generation phase (all *t*s 6.19 - 2.13, all *p*s .04 - <.001, all CIs 1.00 - 36.21). Planned t-tests indicated a facilitation effect, with RP+ narratives being significantly more detailed than RP- narratives at the test phase, $t(64) = 2.26$, $p = .03$, 95% CI [1.70, 27.93]. RP+ narratives did not, however, significantly differ in detail from NRP narratives. Importantly, and in support of the second hypothesis, a forgetting effect was found, as RP- narratives were significantly less detailed than NRP narratives at the test phase, $t(64) = 3.55$, $p = .001$, 95% CI [-22.12, -6.18]. That is, significantly more narrative content was forgotten from RP- narratives than from NRP narratives.

Output order effects were again investigated, to assess whether recall order influenced memory detail at the test phase. A 3 (RP Category: RP+, RP-, NRP) x 2 (Valence: positive, negative) x 2 (Phase: generation, test) x 2 (Output Order: early RP+, early RP-) mixed model ANOVA was conducted and neither the main effect of output order nor the interaction between output order and RP category were significant (respective *F*s: 1.67, 2.48, respective *p*s: .20, .09). The results indicate that the RIF effect for memory detail is unlikely to be due to output interference at the final test.

Memory Detail and RIF Magnitude

Finally, to investigate the third research question of whether variability in narrative detail at retrieval practice would be related to RIF magnitude, a RIF magnitude score was calculated by subtracting the number of correctly recalled RP- memories from the number of correctly recalled NRP memories in the test phase (Koessler, Engler, Riether, & Kissler, 2009) and a hierarchical multiple regression analysis was conducted. In step 1, gender, age and narrative detail at generation were entered as control variables, and accounted for a non-significant 1.7% of the variance in RIF magnitude. In step two, narrative detail at retrieval practice was added to the

regression and significantly explained an additional 6.6% of the variance in RIF magnitude ΔR^2 = .066, ΔF (1, 60) = 4.31, p = .05, B = .003, β = .001, CI [0.001, 0.007]. Thus, when controlling for age, gender and narrative detail at generation, participants with more detailed narratives during retrieval practice had a greater RIF magnitude score, indicating a greater amount of forgetting of RP- memories relative to NRP memories.

Discussion

Our first aim was to determine whether selective discussion of autobiographical memories with children causes forgetting of similar, non-discussed memories, as has been established with adults (Barnier et al., 2004; Harris et al., 2010; Stone et al., 2013; Wessel & Hauer, 2006). We found that selective discussion of autobiographical memories with 8-9 year old children caused forgetting of similar non-discussed memories. This finding indicates that children, as well as adults, show RIF for autobiographical memories, and extends the findings of Marche et al. (2016) to everyday memories that are both positively and negatively valenced. These findings are also consistent with other research indicating that RIF is found for both positively and negatively valenced autobiographical memories (Barnier et al., 2004; Stone et al., 2013) and in childhood (Aslan & Bäuml, 2010, Conroy & Salmon, 2005, 2006). Our findings also add to the well-established literature on the role of conversation in shaping children's autobiographical memories from an early age (Fivush et al., 2006). Not only do children retain information that is included in conversation but they also inhibit information that is excluded. Inhibition of non-discussed memories may focus conversation on previously discussed content, fulfilling the adaptive social goals of building relationships and enabling the child to view themselves as part of a wider community (Stone et al., 2010).

Our second aim was to investigate the impact of selective discussion on memory detail,

specifically whether RIF would be found for the amount of detail reported in memories at the test phase. Previous research has used simplistic measures of RIF that do not allow for a nuanced understanding of effects. Consistent with our second hypothesis, we found that while there was a reduction in memory detail from generation to test across all retrieval practice categories, significantly more narrative detail was forgotten from RP- narratives than NRP narratives. Although the overall reduction in memory detail could have been due to participant fatigue or a to participant-assumed interviewer knowledge, our findings indicate that over and above this global reduction, significantly more memory details were lost from RP- memories than all other memory types. Other researchers, too, have shown that RIF is observed in constrained measures of memory detail (Conroy & Salmon, 2006; Wessel & Hauer, 2006), but the current findings extend this earlier research by showing that this is still the case when participants freely report their autobiographical memories. This is the first study to investigate RIF for autobiographical memory detail with children, and indicates the need for a more nuanced conceptualization of RIF for use in applied contexts, such as autobiographical memory.

Finally, we investigated whether variability in memory detail at retrieval practice was related to RIF magnitude. Although Barnier et al.'s (2004) study with adults did not find a correlation between detail at retrieval practice and RIF magnitude, we found that children who provided more details during retrieval practice had a higher RIF magnitude score, indicating increased forgetting of RP- narratives. The design of our study differs from that of Barnier et al.'s (2004) in three key ways, which may have contributed to the discrepancies in the findings. Firstly, while we used a broad definition of memory detail as total meaningful content in order to maximize variability, Barnier et al. (2004) used a constrained conceptualization of units of added information. This may have resulted in a restricted range of variance and a decreased ability to

detect relationships between RP+ detail and RIF magnitude. Secondly, developmental factors may have played a role. Narrative skill is still developing when children are 8-9 years old and the rate of this development is varied across middle childhood (Chen, McAnally, & Reese, 2013), resulting in higher variability of children's memory detail compared with adults. Again, this may have led to increased sensitivity to detect relationships between memory detail and RIF magnitude in our study. Finally, the studies differ in their analyses. Barnier et al. (2004) analyzed their findings by correlating detail at the retrieval practice phase with each of the retrieval practice categories (RP+, RP- and NRP) at the test phase separately. In contrast, we created a RIF magnitude score and analyzed how changes in memory detail at retrieval practice leads to changes in this magnitude. In combination, these factors may contribute to the differing findings between our study and Barnier et al. (2004) and suggest that more sensitive measures are required to identify associations between memory detail and RIF magnitude.

As memory generation and the final test occurred in a single session, it was not possible to control for output order using cued recall. This limitation is common to many studies investigating RIF for autobiographical memory, and so order effects are typically subsequently assessed (e.g. Barnier et al., 2004; Stone et al., 2013; Wessel & Hauer, 2006). Output order did not influence forgetting of RP- memories, however, and so our findings can best be explained by the response-competition inhibition account of RIF; selective discussion of RP+ memories results in strengthened connections with the category cue, in turn weakening connections between RP- memories and the category cue, leading to reduced recall of RP- memories (Anderson et al., 1994). Moreover, our findings for RIF of memory detail suggest that not only does selective discussion make RP- memories harder to retrieve, but that even when they are successfully retrieved they are retold more sparsely than NRP memories. That is, the

strengthened connections between the category cue and RP+ memories following selective discussion may not only result in inhibition of RP- memories but may also make the details of these memories less accessible even when the memory is recalled.

Finally, our findings that increased memory detail during retrieval practice was linked to increases in RIF magnitude provides support for the theory that increasing the strength of RP+ items strengthens their connection with the category cue and weakens connections between the cue and RP- items, thereby increasing the magnitude of RIF (García-Bajos et al., 2009; Norman et al., 2007). In this case, strengthened connections between RP+ memories and the category cue may serve to decrease competitor activation, making RP- memories less likely to be recalled in the final test and increasing RIF magnitude. While this explanation is consistent with a blocking account of RIF, it is likely that inhibition is also implicated in this process, given the considerable support for an inhibitory account of RIF (Storm & Levy, 2012). Applied to our findings, increases in RP+ strength may lead to increases in the extent of inhibition required to suppress RP- items resulting in greater magnitudes of forgetting. The complex relationship between RP+ strength and RIF magnitudes proposed by Norman et al. (2007) and the role of inhibition cannot, however, be fully explored in our study, as memory detail was not experimentally manipulated. Future studies should aim to experimentally investigate this nonmonotonic relationship.

One limitation of our study is that RIF is demonstrated only over a short delay. As is typical in RIF research (Murayama et al., 2014), our study has a delay period of 5 minutes between retrieval practice and final test. While there are mixed findings regarding the duration of the forgetting effect (see Storm et al., 2015 for review), research has found it can last up to a week when using category-exemplar stimuli (Storm, Bjork, & Bjork, 2012). Future research

should investigate the longevity of forgetting of autobiographical memories with children using the RIF paradigm, as more complex and personally relevant stimuli may not follow the same pattern of forgetting over time. It should also be noted that it was not possible to evaluate the accuracy of the autobiographical memories selected by participants in this study, and this is a limitation common to all work with self-generated autobiographical memories. Nonetheless, this study is the first to find RIF of everyday autobiographical memories with children, conceptualized as both the number of memories recalled and the amount of detail reported. Memory detail at retrieval practice was also related to RIF magnitude, such that individuals who included more detail in their RP+ memories forgot RP- memories at a greater magnitude than individuals who included less detail.

Chapter 3

Study 2: Shorter and Longer-Term Effects of Selective Discussion of Adolescents' Autobiographical Memories

The previous chapter established that selective discussion of children's autobiographical memories leads to RIF. The current chapter builds on this by using the same RIF paradigm to investigate the impact of selective discussion on adolescents' autobiographical memories. Adolescence is a period of uneven development where some skills are enhanced and others are perturbed (Blakemore & Choudhury, 2006). It is therefore important to investigate how cognitive processes, such a RIF, function during adolescence. Study 2 extends the findings of the first study in two ways; first, the RIF paradigm was applied to an older group of youth and second, the longer-term impact of selective discussion was investigated by adding a second recall test after a 1-day delay. As such, we increase the applicability of our findings to real-world conversations by establishing whether RIF for adolescents' autobiographical memories endures for longer than a single experimental session.

This chapter is composed of a manuscript that is currently under second review with the Journal of Experimental Child Psychology:

Glynn, R., Salmon, K., & Low, J. (2018). *Shorter and longer-term effects of selective discussion of adolescents' autobiographical memories.* Manuscript under review.

Abstract

We investigated whether selective discussion leads to retrieval-induced forgetting (RIF) for early to mid-adolescents' positive and negative autobiographical memories after delays of 5 minutes and 1 day. Adolescents (ages 13-15 years, $N = 58$) completed an adapted version of the RIF paradigm for adult's emotionally-valenced autobiographical memories. Following findings that RIF occurs for children's positive and negative memories (Glynn, Salmon, & Low, 2018) and adults' negative autobiographical memories only (e.g. Wessel & Hauer, 2006), we posed 3 research questions: (1) would RIF occur for adolescents' autobiographical memories after a short delay, (2) would adolescents' demonstrate a RIF valence effect, and (3) would any RIF findings be replicated after a longer delay? We found RIF for negative memories after both a short and longer delay. We also found RIF for positive memories but only after the longer delay. The potential mechanisms underpinning these findings are discussed.

Introduction

Despite much research demonstrating changes in autobiographical memory across adolescence (e.g. Habermas & Reese, 2015, Reese et al., 2011), no research has investigated the influence of selectively discussing some personal experiences at the expense of others (termed retrieval-induced forgetting; RIF) in adolescence. All research to date has investigated RIF for positive and negative autobiographical memories in children (Glynn, Salmon, & Low, 2018) and adults (e.g. Barnier, Hung, & Conway, 2004; Wessel & Hauer, 2006), effectively ignoring this dynamic developmental period. Moreover, no research has investigated the duration of RIF effects in adolescence. The overarching aim of this experiment was to address this important gap in the literature. We focused on the period of early to mid-adolescence (13-15 years), taking account of recent work demonstrating that adolescence is not one unified period, but should be conceptualized as a series of developmental transitions (Zimmermann & Iwanski, 2018). Specifically, our aims were threefold. First, we investigated whether selective discussion of positive and negative autobiographical memories with 13-15-year-old adolescents produces RIF. Second, we aimed to establish whether adolescents would manifest the RIF memory valence effects found with adults (see Storm et al., 2015 for review), but not children. Third, we investigated the effects of a 1-day delay on RIF effects.

Retrieval-Induced Forgetting

Applied to the area of autobiographical memory, the RIF paradigm can be used as an experimental proxy for conversation about emotionally-valenced experienced events (Glynn et al., 2018). While the original RIF paradigm uses category-exemplar word pairs (Anderson, Bjork, & Bjork, 1994), the adapted RIF paradigm that is most commonly used for autobiographical memory involves participants self-generating personal experiences, categorized

by valence, positive and negative, before the experimenter assigns each memory to a retrieval practice category. Participants then repeatedly retrieve a selection of either positive or negative memories, which are termed RP+ memories. Memories from the same valence category that are not selectively retrieved are termed RP- memories, and memories from the alternative valence category are termed NRP memories. After a short delay, typically 5-20 minutes, participants are asked to recall their positive and negative memories. Findings indicate that not only is recall of RP+ memories enhanced relative to NRP memories, but recall of RP- memories also diminishes relative to NRP memories (see Storm et al., 2015 for review). The most widely accepted theoretical account of RIF, the response-competition inhibition account, proposes that items compete during retrieval practice, leading to response competition, and that RP- items must be inhibited in order to correctly recall RP+ memories in this phase, leading to a reduced ability to later recall RP- items relative to NRP items (see Storm & Levy, 2012 for review).

RIF for Adolescents' Autobiographical Memories

On the surface, it may appear that RIF for emotionally-valenced autobiographical memories is not impacted by developmental processes; it is found for both children (Glynn et al., 2018) and adults (see Storm et al., 2015 for review). Delving deeper, however, reveals potential differences in the way selective discussion impacts the memories of children and adults. While a number of studies with adults have found RIF for negative memories only (e.g. García-Bajos & Migueles, 2017; Harris, Sharman, Barnier, & Moulds, 2010; Wessel & Hauer, 2006), Glynn et al.'s (2018) study with 8-9-year-old children found RIF for both positive and negative autobiographical memories. These findings should be interpreted with caution, however, as theirs is the only study that has investigated RIF for children's positive and negative autobiographical memories and RIF valence findings for adults' autobiographical memories have been mixed (see

Storm et al., 2015 for review). It is important to establish whether the many socio-cognitive changes that occur during early to mid-adolescence (Dahl, Allen, Wilbrecht, & Suleiman, 2018) impact cognitive processes such as RIF and could lead to the emergence of the RIF valence effect seen with adults.

To date, the only mechanism that has been proposed as an explanation for the RIF valence effect for autobiographical memories is "positivity memory bias"; a preference for storing and retrieving positive memories over negative ones (García-Bajos & Migueles, 2017; Storm & Jobe, 2012; Storm et al., 2015). From a theoretical perspective, this bias is caused both by adults' tendency to perceive experiences as positive rather than negative and the "fading affect bias", whereby the emotional intensity of negative memories fades faster than that of positive memories (Walker, Skowronski, & Thompson, 2003). In RIF, positivity bias may increase the salience of adults' positive autobiographical memories, protecting them from being forgotten following retrieval practice (Storm & Jobe, 2012). The positivity bias emerges and grows stronger across development; it is absent in infancy (Vaish, Grossmann, & Woodward, 2013) and weaker in younger adulthood compared with older adulthood (Mather & Carstensen, 2005). Although research on the positivity memory bias during adolescence is lacking, research with early adolescents (13 years) has found that rates of negative affectivity peak during this period (Opitz, Gross, & Urry, 2012). Since the positivity bias has been implicated as a key factor in the maintenance positive mood states (Walker et al., 2003), this developmental finding could indicate that the positivity bias is not fully developed in early adolescence. Early to mid-adolescents' positive and negative memories, therefore, may be equally susceptible to RIF, leading to RIF findings similar to Glynn et al.'s (2018) study with 8-9-year-old children, with regard to memory valence.

Conversely, key developments in narrative construction that occur between early and mid-adolescence could contribute to the emergence of valence-dependent RIF findings. Whereas children report all memories as unique events (Reese et al., 2011), in mid-adolescence a distinction emerges in the way positive and negative memories are recalled; negative memories are recalled as distinct and unique events (e.g. death of a loved one) and positive memories are recalled from a general, global perspective (e.g. graduation; Holland & Kensinger, 2010). This distinction has been linked to mid-adolescents' ability to communicate in the form of a life story, whereby memories that are typically positively-valenced are ordered into culturally-appropriate lifetime periods (Habermas & Reese, 2015). These developments could alter the impact of selective discussion on positive and negative memories and lead to the emergence of a RIF valence effect for early to mid-adolescents' autobiographical memories, such that negative RP- memories are more susceptible to RIF than positive RP- memories.

Duration of RIF

No research has investigated the duration of RIF following selective retrieval practice using emotionally-valenced stimuli. Yet establishing the duration of RIF effects is crucial for understanding its real-world everyday implications. Such investigation would also shed light on how delay influences inhibition for emotionally-valenced stimuli.

When investigating the duration of RIF with non-emotional stimuli, some studies with adults did not find RIF at a delay of 24 hours (e.g. Saunders, Fernandes, and Kosnes, 2009; MacLeod & Macrae, 2001), while others found evidence of RIF over time (e.g. García-Bajos, Migueles, and Anderson; 2009; Migueles & García-Bajos, 2007). Using almost identical methodology, García-Bajos et al. (2009) found RIF after a 1-week delay with eyewitness stimuli, using details of a bank robbery video, while Saunders et al. (2009) did not find RIF after a 24

hour delay using word-pair stimuli. The inconsistent findings may suggest that realistic stimuli are more vulnerable to forgetting over time than simple word-pair stimuli.

Current Study

Our investigation had two phases. First, we investigated the impact of selective discussion of 13-15-year-olds' positive and negative autobiographical memories on recall following a short delay. Second, we investigated whether RIF persists for longer than the initial test by administering a second follow-up test 1 day after selective discussion. Given the absence of research investigating adolescents' memory processes, specifically with regard to memory valence effects, we were not able to generate hypotheses. Rather we posed a series of research questions, the first two to be answered during the first phase, and the final question to be answered at the second phase; first, would adolescents demonstrate RIF of autobiographical memories following selective discussion; second, would a RIF valence effect emerge for adolescents' autobiographical memories; and third, would the findings at the short-delay test be replicated at the 1-day follow-up test?

Method

Participants. Participants were 58 adolescents between ages 13 and 15 years (M = 14.43 years, SD = 0.95 years), of whom 53.4% were female and 50% identified as European (24.1% Pacific Peoples, 10.3% Māori, 10.3% African, 5.2% Other). Participants were recruited from high schools and youth groups in New Zealand. Informed consent was obtained from participants' parents and verbal assent given by participants before the procedure began.

Materials and Procedure. We used an adapted version of Stone, Luminet, and Hirst's (2013) RIF paradigm for autobiographical memory. In the first 30-40-minute session, the standard RIF paradigm was administered, consisting of the *generation, learning, retrieval*

practice, distractor, and *short-delay test* phases. In the second 10-minute session, 1-2 days later, a *follow-up test* was administered.

Generation. Participants were asked to generate 6 positive and 6 negative autobiographical memories, starting with a positive memory and then alternating between valences until all 12 memories were generated. Examples of a positive ("winning a competition") and negative ("arguing with a friend") memory were provided, and participants were informed that there were no right or wrong answers. Details of each memory were written down by the interviewer. There was no time limit for memory generation and all participants were given a standardized prompt to provide more information. Participants also rated the valence of each memory on a 5-point scale (1 = *very positive,* 5 = *very negative*) and generated a title for each memory. A *positive* memory could be, *"When I won a gymnastics competition",* with the title, *"Competition".*

Learning. Each generated memory was read back to participants by the researcher along with the memory's valence and title (e.g. *Positive - Competition - "When I won a gymnastics competition").* Triads were read in the same order they were generated.

Retrieval Practice. One memory valence category was selected for retrieval practice (e.g. *positive*) and valence was counterbalanced across participants. The researcher selected memories from this category for retrieval practice, and participants recalled each three times in a random order. Memory selection order was also counterbalanced; either the first 3 or second 3 memories from the selected valence were chosen. Participants were presented with the memory valence and title and asked to verbally recall the corresponding autobiographical memory in as much detail as possible. Participants were asked to provide details of first the causes, then the consequences, and finally the importance of the event (Harris et al., 2010). Memories selected for recall in this

phase were the RP+ memories, memories from the same valence category that were not selected for recall in this phase were the RP- memories, and memories from the non-selected valence category were the NRP memories.

Distractor. Participants were given a selection of activities to complete for a duration of 5 minutes, including puzzles and coloring.

Short-Delay Test. Participants were asked to recall their memories from the generation phase, in as much detail as possible. Half of the participants recalled positive memories first and the other half recalled negative memories first. Participants continued to freely recall memories from each valence category until they could not remember any more memories.

Follow-Up Test. This phase was a replication of the *short-delay test* phase and took place 1-2 days later. Recall order was counterbalanced; if participants recalled positive memories first during the test phase, they again recalled positive memories first in the follow-up test.

Data Analysis. We conducted separate 2 (Valence: positive, negative) x 3 (RP Category: RP+, RP-, NRP) mixed model ANOVAs at each replication of time (short-delay test; follow-up test). We used G*Power (Erdfelder, Faul, & Buchner, 1996) to conduct an a priori power analysis, and drew on studies of RIF for autobiographical memories, (Glynn et al., 2018; Wessel & Hauer, 2006) to estimate effect size and correlations between variables. Results showed that a total sample size of 50 participants was required to reliably detect an interaction between valence and retrieval practice category ($\eta^2 = 0.12$, $\alpha = .95$), indicating that our sample ($N = 58$) is sufficient to conduct the proposed analysis.

Results

Manipulation Checks

Generation. All participants generated 6 positive and 6 negative autobiographical memories. Participants rated the valence of their memories (1 = *very positive,* 3 = *neither positive nor negative,* 5 = *very negative*). A paired sample t-test indicated that positive memories (M = 1.42, SD = 0.29) were rated as significantly more positive than negative memories (M = 3.96, SD = 0.38), $t(57) = 39.56$, $p < .001$, 95% CI [-2.67, -2.41].

Test Phase. Memories at the short-delay and follow-up tests were considered correctly recalled if they contained enough information for the primary investigator to unambiguously match the report to a memory in the generation phase. Analyses were bootstrapped where appropriate, as the data were not normally distributed. Neither recall order, age, nor gender significantly interacted with RP category at either test phase. (Short-delay respective Fs: 0.31, 0.36, respective ps = .74, .71, Follow-up respective Fs: 0.05, 0.28, respective ps: .95, .76)

Follow-up Test. The final sample size at the follow-up test was 57. For six participants the test was administered after 2 days rather than 1 day. A mixed model ANOVA showed that the main effect of delay (F = 0.28, p = .60) and the interaction of delay and RP category (F = 1.17, p = .31) were not significant.

Output Interference. We utilized Macrae and Roseveare's (2002) procedure for ranking recall order to eliminate output interference as an explanation. Neither the main effect of output order (short-delay: F = 0.19, p = .67, follow-up: F = 0.05, p = .83) nor the interaction between output order and RP category (short-delay F = 0.22, p = .80, follow-up F = 1.51, p = .23) were significant at either test replication. Output interference is unlikely to have influenced RIF at either test.

Research Questions 1 and 2: RIF for Positive and Negative Memories at the Short-Delay Test

A mixed model ANOVA at the short-delay test revealed a significant main effect of RP category, $F(2, 112) = 12.16$, $p < .001$, $\eta^2 = .18$, and a significant interaction between valence and RP category, $F(2, 112) = 3.95$, $p = .02$, $\eta^2 = .07$. Paired samples t-tests, conducted separately for positive and negative memories (see Table 2 for descriptive statistics), showed that for positive memories, there was a partial facilitation effect; participants recalled a significantly greater proportion of RP+ memories than NRP memories, $t(28) = 3.57$, $p = .001$, CI [0.06, 0.23]. There was no significant difference in the proportion of positive RP- and NRP memories recalled, indicating that RIF did not occur for positive memories. For negative memories, participants recalled a significantly smaller proportion of RP- memories than NRP memories, $t(28) = 2.60$, $p = .02$, CI [-0.25, -0.03], indicating RIF for negative memories. In sum, the findings indicate that RIF occurred for negative memories only (see Figure 3).

RP Category	Short-Delay Test				Follow-Up Test			
	Positive		Negative		Positive		Negative	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
RP+	0.91	0.15	0.87	0.19	0.86	0.24	0.82	0.26
RP-	0.82	0.26	0.62	0.32	0.62	0.29	0.54	0.34
NRP	0.76	0.19	0.76	0.17	0.70	0.24	0.64	0.19

Table 2. Descriptive statistics for the proportion of positive and negative memories correctly recalled at the short-delay and follow-up tests.

Research Question 3: RIF for Positive and Negative Memories at the Follow-Up Test

A mixed model ANOVA at the follow-up test revealed a significant main effect of RP category, $F(2, 110) = 17.79$, $p < .001$, $\eta^2 = .24$, but the interaction between RP category and valence was not significant. A planned t-test revealed that participants recalled significantly

fewer RP- memories (M = 0.58, SD = 0.32) than NRP memories (M = 0.67, SD = 0.21), $t(56)$ = 2.06, p = .04, CI [-.17, -.002]. In sum, we found a replication of the RIF effect for negative memories and the emergence of RIF for positive memories (see Figure 3).

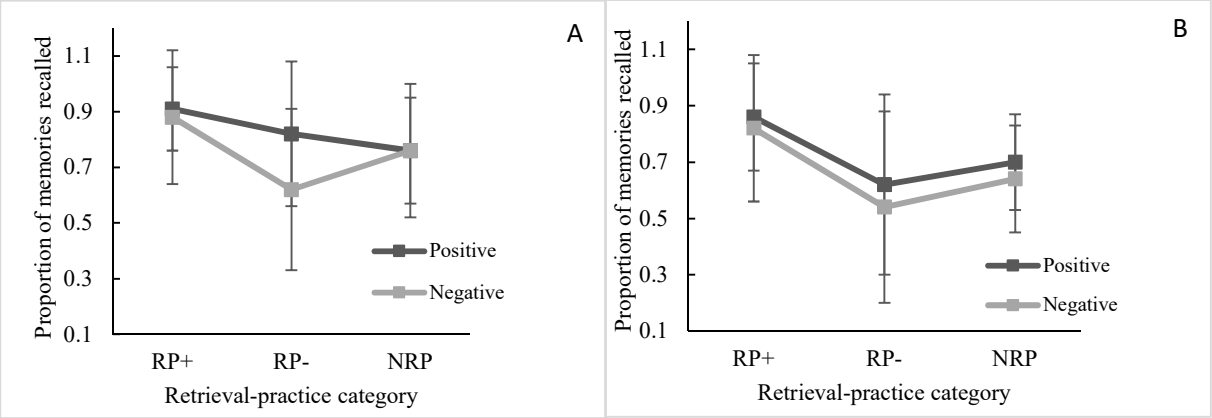

Figure 3. Proportion of memories recalled at the short-delay test (Graph A) and follow-up test (Graph B) phase for positive and negative memories in each retrieval-practice category. Error bars represent standard deviations.

Discussion

We investigated RIF for 13-15-year-old adolescents' self-generated positive and negative autobiographical memories over both a short delay and a longer delay period of 1 day. We posed three research questions; do early to mid-adolescents show RIF for autobiographical memories, do they demonstrate a RIF valence effect or do they show RIF for both positive and negative memories, and are any RIF findings replicated after a 1-day delay? Our first two research questions were investigated at the short-delay test, and our final research question pertained to findings from the 1-day delayed follow-up test.

Findings at the short-delay test indicated that when participants selectively discussed negative memories, they forgot their non-discussed negative memories relative to their non-

discussed positive memories; that is, we found RIF for negative memories. When they selectively discussed positive memories, however, they did not forget their non-discussed positive memories relative to their negative memories; that is, we did not find RIF for positive memories. It appears that by early to mid-adolescence, the age of our participants, the pattern of RIF for emotionally-valenced autobiographical memories following a short delay is more similar to those found with adults (e.g. García-Bajos & Migueles, 2017; Harris et al., 2010; Wessel & Hauer, 2006) than with 8-9-year-old children (Glynn et al., 2018). Our final research question asked whether findings from the short-delay test would be replicated at the delayed follow-up test. Since RIF was found for negative memories only at the short-delay test, we were specifically interested in whether this memory valence effect would persist over a delay of 1 day. Our findings indicated that despite the consistent pattern demonstrating RIF for negative memories at both the short and longer delay, the RIF valence effect disappeared at the longer delay; that is, we found RIF for both positive and negative autobiographical memories. Thus, it appears that after a longer delay, RIF patterns for adolescents' positive and negative autobiographical memories more closely resemble those found with 8-9-year-old children (Glynn et al., 2018) than adults (e.g. García-Bajos & Migueles, 2017; Harris et al., 2010; Wessel & Hauer, 2006).

When considered in isolation, our findings for negative memories are consistent with others showing that RIF can persist over a duration of at least 1 day (e.g. García-Bajos et al., 2009; Storm, Bjork, Bjork, & Nestojko, 2006). Our findings for positive memories, conversely, are less consistent with previous research findings, but could suggest that RIF for adolescents' positive and negative memories emerges after different delay periods. Since the current study did not directly investigate RIF mechanisms, we can only speculate about the causes of the RIF

valence effect at the short-delay test and the emergence of a delayed RIF effect for positive memories. One possibility is that the emergence and subsequent disappearance of the RIF valence effect over the 2 tests could be explained by positivity memory bias (Walker et al., 2003). Consistent with suggestions that the positivity bias strengthens across development (Mather & Carstensen, 2005), the temporary presence of a RIF valence effect at the short-delay test, but not the follow-up test, could indicate that the positivity bias is weakly emerging in early to mid-adolescence. While the positivity bias may function strongly enough to protect positive memories from being forgotten following selective discussion for a short duration, it may not continue to protect them in the longer term. It is also possible, however, that the RIF valence effect is a temporary phenomenon for adults as well as adolescents, as no studies have investigated the enduring effects of selective discussion for adults' positive and negative memories. In order to test the hypothesis that the memory valence effects for adolescents is more fragile than for adults, adolescents should be included in experimental studies investigating the positivity memory bias and future RIF studies for adults' autobiographical memories should include longer delays.

Appealing to the response-competition inhibition account of RIF (Anderson et al., 1994), failing to find RIF after a short-delay does not preclude the possibility of adolescents' positive RP- memories being inhibited during selective discussion, but the inhibition process may take longer for some stimuli than others. The emerging ability in mid-adolescence to communicate significant and typically positively-valenced experiences in the form of a life story (Habermas & Bluck, 2000; Habermas & Reese, 2015) may cause adolescents' positive memories to be more strongly connected with one another than their negative memories. If, in our study, adolescents' positive autobiographical memories are more strongly connected with one another than their

negative memories, our findings raise the possibility that stimuli connectedness may slow, but not eliminate, the process of RIF. Stimuli connectedness has been found to buffer the RIF effect (Anderson, 2003), but whether delay moderates the effect of stimuli connectedness is yet to be investigated. The ability to structure memories into a life story structure continues to improve into adulthood (Habermas & Reese, 2015). Thus, adolescents' positive memories may be sufficiently connected to protect them from inhibition after a short delay but not connected enough for the buffer effect to be sustained over time. This could explain why positive memories were only forgotten at the follow-up test. Future research should experimentally manipulate stimuli connectedness to investigate the interaction of delay and connectedness on RIF.

Regardless of the specific mechanism, however, our findings add to the growing body of research investigating how the many developmental changes that occur throughout adolescence impact socio-cognitive processes (Blakemore & Choudhury, 2006). Our contrasting findings at the short-delay and follow-up tests highlight the nuanced developmental patterns that emerge during adolescence and reinforce the notion that adolescence should not simply be considered a "developmental bridge" from childhood to adulthood (Zimmermann & Iwanski, 2018). This study expands RIF findings for autobiographical memory beyond a single session experiment, increasing ecological validity and allowing more confident conclusions to be drawn about how RIF functions in real-world conversations. Future research should also continue to investigate boundary constraints of RIF for applied stimuli such as autobiographical memory in children, adolescents, and adults in order to better understand how the phenomenon extends to real-life settings.

Chapter 4

Study 3: RIF for Autobiographical Memories Beyond Recall Rates: A Developmental Study

The previous two chapters investigated the effects of selective discussion on children and adolescents' autobiographical memories separately. The current chapter builds on this by combining the samples from these studies and directly analysing the differences in the way selective discussion impacts the autobiographical memories of children and adolescents. Study 1 found that even when children's RP- memories were recalled, they were recalled with fewer memory details than NRP memories. Study 3 further explores the impact of selective discussion on young people's memory details by using two specific measures of detail: narrative coherence (Reese et al., 2011) and episodic and non-episodic details (Addis, Wong, & Schacter, 2008). Although the impact of selective discussion on memory details has been investigated for both children (Conroy & Salmon, 2006) and adults (Wessel & Hauer, 2006), findings cannot be compared across development, as each study used a different definition of memory detail. Study 3, therefore, represents the first investigation of the developmental differences in the impact of selective discussion on children and adolescents' autobiographical memory details.

Abstract

We investigated whether selective discussion of autobiographical memories would impact young people's recall of the details of their non-discussed memories. Children (ages 8-9 years, n = 65) and adolescents (ages 13-15 years, n = 58) completed an adapted version of the retrieval-induced forgetting (RIF) paradigm for self-generated positively- and negatively-valenced autobiographical memories. We defined memory details as narrative coherence (Reese et al., 2011) and episodic and non-episodic information (Addis, Wong, & Schacter, 2008). In light of developmental findings in other domains of autobiographical memory research (e.g. Reese et al., 2011; Willoughby, Desrocher, Levine, & Rovet, 2012), we hypothesised that selective discussion would result in RIF for children's, but not adolescents', narrative coherence and episodic detail, and that RIF would not occur for non-episodic details for either children or adolescents. Findings for narrative coherence and non-episodic detail indicated support for our hypotheses. Findings for episodic detail were in partial support of our hypothesis; RIF for episodic detail was found for both children and adolescents. Our findings not only demonstrate the importance of investigating the wider effects of RIF but also uncovered developmental differences previously overlooked in the field.

Introduction

We regularly talk to others about our experiences in conversations that are selective; some events are discussed at the expense of others. Findings have shown that when a selection of memories are discussed, non-discussed memories that are similar in nature are less likely to be recalled in future, a phenomenon termed retrieval-induced forgetting (RIF; Anderson, Bjork, & Bjork, 1994). Investigations of the broader effects of selective discussion beyond the likelihood of recalling events in future are lacking, however. Using autobiographical memories as RIF stimuli affords opportunities to investigate the more nuanced effects of selective discussion (Glynn, Salmon, & Low, 2018). Moreover, although many developmental studies have found that RIF is consistent across age (e.g. Ford, Keating, & Patel, 2004; Lechuga, Moreno, Pelegrina, Gómez-Ariza, & Bajo, 2006), an investigation of the wider-reaching effects of selective discussion may reveal subtle developmental differences. The first aim of this study was to investigate the effect of selective discussion of autobiographical memories on the memory detail reported in non-discussed but recalled memories. As such, rather than conceptualising RIF as a failure to recall non-discussed memories, we conceptualise RIF as information forgotten from non-discussed memories. Our second aim was to investigate whether the impact of selective discussion on the memory details of non-discussed but recalled autobiographical memories would differ for 8-9-year-old and 13-15-year-old young people.

In the following sections, we will first outline the RIF procedure most commonly used for use with autobiographical memories and its theoretical underpinnings. We will briefly review current findings on the impact of selective discussion on autobiographical memory detail before outlining our twofold approach to conceptualising autobiographical memory detail. Since the development of autobiographical memories can be conceptualised from both a cognitive

(Tulving, 2002) and socio-cultural (Nelson & Fivush, 2004) theoretical perspective, our study adopts two measures of autobiographical memory detail, one from each theoretical perspective. For each measure, we will discuss the possible developmental implications for RIF of autobiographical memory details before outlining the aims and hypotheses for the current study.

Retrieval-Induced Forgetting for Autobiographical Memory

The RIF paradigm was initially designed for use with category-exemplar word pairs (Anderson et al., 1994), and has also been successfully adapted for use with adults' positive and negative autobiographical memories (see Storm et al., 2015 for review). In these studies, participants generate a series of positive and negative autobiographical memories and recall them in detail, before the experimenter chooses a selection of either negative or positive memories for retrieval practice. Memories included and recalled in this phase are termed RP+ memories, memories of the same valence but not included in retrieval practice are termed RP- memories, and memories of the alternative valence, none of which are included in retrieval practice, are termed NRP memories. Following this procedure, a number of studies have found RIF for adults' autobiographical memories; that is, participants recall a greater proportion of their NRP memories relative to their RP- memories. There have been some inconsistencies with regard to memory valence, however, with some studies finding RIF for both positive and negative memories and others finding RIF for negative memories only (Storm et al., 2015). Extending these findings further, our studies have been the first to find RIF for 8-9-year-old children's (Glynn et al., 2018) and 13-15-year-old adolescents' (Glynn, Salmon, & Low, under review) emotionally-valenced autobiographical memories.

The response-competition inhibition account is the most widely accepted theory of RIF, which posits that RP+ and RP- memories are in competition during retrieval practice, leading to

inhibition of RP- memories and subsequent forgetting in later testing (Storm & Levy, 2012). Somewhat overlooked, however, is the possibility that inhibition of RP- items during retrieval practice could also impair future recall in other ways. As we have previously identified (Glynn et al., 2018), the use of autobiographical memories as RIF stimuli provides new opportunities to investigate the ways in which selective discussion may impact RP- memories even when they are recalled. It is possible that different conceptualisations of RIF will reveal more nuanced understandings of the impact of selective discussion that crude conceptualisations have so far missed.

RIF for Autobiographical Memory Detail

In our study with 8-9-year-old children (Glynn et al., 2018), we extended previous conceptualisations of RIF by investigating the impact of selective discussion on the sheer amount of memory detail recalled in RP- memories. Although our study found that children recalled RP- memories in sparser detail than NRP memories, we were limited in our ability to draw conclusions about what kind of detail was lost from RP- memories due to the breadth of our memory detail measure. As our aim was to establish whether selective discussion bore any impact on children's ability to recall the details of their memories, we defined memory detail as "meaningful word count". This definition provides a sensitive measure of memory detail, but it does not provide information about what kind of detail is lacking from recalled RP- memories. By establishing that selective discussion with children does, in fact, lead to forgetting of memory details for non-discussed memories, our study paves the way for further investigation into what kind of memory details are forgotten as a result of selective discussion.

In addition to our study with children, Wessel and Hauer's (2006) study with adults is the only other investigation of the impact of selective discussion on the memory details reported in

self-generated autobiographical memories. In their study, for each autobiographical memory, participants recalled details in response to the cues of *where*, *when*, *who*, and *what* both at the generation and test phases of the procedure. Memory detail was defined as the total amount of information for each cue correctly recalled from the generation to test phase and participants were given a score from 0, indicating that no details for any cue were correctly recalled from the generation phase, to 4, indicating that all the details for every cue matched the details provided at the generation phase. Consistent with our findings with children (Glynn et al., 2018), their study found RIF for autobiographical memory detail; adults forgot more of the details in their RP- memories relative to NRP memories. Thus, findings to date indicate that discussion of some autobiographical memories with both adults and 8-9-year-old children leads to impoverished recall of RP- memories. Glynn et al. (2018) and Wessel and Hauer (2006) used different measures of memory detail, however, and it is therefore not possible to draw developmental conclusions from these findings. Moreover, neither study investigated what kind of details are forgotten from RP- memories. Autobiographical memories contain a range of information (Levine, Svoboda, Hay, Winocur, & Moscovitch, 2002), so memory detail should be defined with more specificity in order to make meaningful inferences about the ways in which selective discussion impairs recall of RP- memories.

Conceptualisation of Autobiographical Memory Detail

Autobiographical memory is complex and fundamental to human functioning (Conway & Pleydell-Pearce, 2000) and it has attracted research from many fields of psychology, including developmental (e.g. Nelson & Fivush, 2004; Habermas & Reese, 2015), neurological (e.g. Greenberg & Rubin, 2003; Svoboda, McKinnon, & Levine, 2006), and clinical (e.g. Williams & Broadbent, 1986; Dalgleish & Werner-Seidler, 2014) fields. As a result, a number of theoretical

accounts of autobiographical memory have developed, each in isolation (Graci, Watts, & Fivush, 2018). Some theorists have attempted to develop overarching integrated accounts of autobiographical memory (e.g. Conway & Pleydell-Pearce, 2000; Conway, 2005), but most autobiographical memory research is carried out in isolated silos. Our study attempts to bridge the gulf by including two measures of autobiographical memory detail; narrative coherence (Reese et al., 2011), developed from a socio-cultural developmental perspective of autobiographical memory (Nelson & Fivush, 2004), and episodic and non-episodic detail (Addis, Wong, and Schacter, 2008), developed from a cognitive perspective of autobiographical memory (e.g. Tulving, 2002; Wheeler, Stuss, & Tulving, 1997). Both measures are well-suited for our purpose, as children and young people's ability in both domains significantly improves between the developmental stages of mid-childhood to early-adolescence (Habermas & Reese, 2015; Reese et al., 2011; Willoughby et al., 2012). We are, therefore, able to investigate the developmental effects of selective discussion on both facets of autobiographical memory detail for 8-9-year-old children and 13-15-year-old adolescents.

When RIF is conceptualised as the number of memories recalled, no developmental differences have been found between children aged at least 5 years old and adults (e.g. Aslan & Bäuml, 2010; Ford et al., 2004; Lechuga et al., 2006). In light of children's and adolescents' developing ability to produce detailed autobiographical memories, however, it is possible that conceptualising RIF as the amount of memory detail recalled will produce developmental differences previously missed. In the following sections, we will first discuss autobiographical memory and its development from a socio-cultural developmental perspective, before considering the same factors from a cognitive perspective.

Socio-Cultural Developmental Theory of Autobiographical Memories. Nelson and

Fivush's (2004) theory of autobiographical memory development weaves together findings of how social, cognitive, and narrative processes operate throughout childhood and adolescence and contribute the emergence of one's ability to locate the self in the past, present, and future. According to this theory, autobiographical memories are typically recalled in the form of personal narratives, defined as accounts of the past in which events are placed in context and evaluative information is provided (Nelson & Fivush, 2004). Communicating experiences in this way is beneficial to both the narrator and the listener, as it allows for greater explanation of the significance of an event and promotes a mutual understanding of the unique qualities of the narrator (Beike, Brandon, & Cole, 2016). Children and adolescents learn to construct narratives primarily through conversations with their parents (Nelson & Fivush, 2004) and these narratives improve in quality across development (Köber, Schmiedek, & Habermas, 2015; Reese et al., 2011). For instance, 2-3-year-old children are able to communicate their experiences using basic event scripts, 9-year-old children begin to tell their memories in a simple narrative structure, and narratives continue to increase in complexity until early adulthood (Habermas & Bluck, 2000). People who can construct a high-quality narrative, in which their experience is effectively communicated in an engaging way, are more likely to recall these memories in future (Morris, Baker-Ward, & Bauer, 2010). Thus, if discussing a selection of autobiographical memories impacts people's ability to produce high-quality narratives for non-discussed experiences, long-term retention of these experiences may be compromised even if their memory is recalled.

Narrative Coherence and RIF Across Development. Reese et al. (2011) assert that a coherent narrative structure is a fundamental element of a high-quality autobiographical narrative; while additional elements can improve the quality of a narrative, a coherent structure is a basic requirement on which other narrative skills are built. Coherence is the ability to express a

narrative in such a way that a naive listener can understand not only what events took place, but also what personal meaning the individual drew from their experience (Reese et al., 2011). Findings show that narrative coherence as a global construct steadily increases with age (Habermas & de Silveira, 2008), but Reese et al. (2011) suggest that coherence is best captured along three independent dimensions; contextual coherence, defined as explaining where and when an event took place; chronological coherence, defined as explaining the order of events; and thematic coherence, defined as explaining the high point and resolution of the story.

Reese et al.'s (2011) approach enables a nuanced understanding of narrative coherence development, with studies showing that each coherence dimension has a different developmental trajectory; chronological coherence develops first, peaking in early adolescence, followed by context coherence, peaking in early adulthood, and then finally theme coherence, which continues to develop across the lifespan. Therefore, although children have lower levels of global coherence than adolescents, they are able to structure their narratives with higher chronological and contextual coherence relative to thematic coherence. Similarly, although the narratives of children and adolescents differ substantially with regard to thematic coherence, they may have similar levels of chronological and contextual coherence. Selective discussion of autobiographical memories may, therefore, impact narrative coherence differently for children and adolescents; while narrative coherence may be detrimentally affected for children, adolescents may still be able to produce RP- memories with high levels of coherence following selective discussion.

Cognitive Theory of Autobiographical Memories. The cognitive perspective of autobiographical memories is strongly influenced by the work of Tulving and colleagues, who were the first to propose that separate memory systems govern autobiographical recall; one that

produces a sense of "knowing" and another that produces a sense of "re-experiencing" (e.g. Tulving, 1984; Tulving, 2002, Wheeler et al., 1997). The theory asserts that both the episodic and semantic memory systems are implicated in the production of autobiographical memories (Levine et al., 2002; Prebble, Addis, & Tippet, 2013). The episodic memory system is autonoetic; it is the only memory system that allows individuals to consciously re-experience past events (Tulving, 2002). Episodic detail creates a vivid sensory, perceptual and emotional picture of a specific event, located in time and place (Willoughby et al., 2012). Conversely, the semantic memory system noetic; it contains both facts and characteristics of the self and other general knowledge and is considered the memory system out of which episodic memory arises (Tulving, 2002). A combination of both episodic and semantic details is required, however, in order to construct a complete autobiographical memory (Cole, Gill, Conway, & Morrison, 2012; Levine et al., 2002).

Episodic and Non-Episodic Detail and RIF Across Development. Tulving (2002) suggests that the episodic memory system evolves from the semantic memory system; it is considered more advanced than semantic memory (Prebble et al., 2013) and it emerges later than semantic memory (Wheeler et al., 1997). Using an adapted version of Levine et al.'s (2002) internal and external coding protocol, whereby autobiographical memory details are categorised as either episodic or non-episodic, Willoughby et al. (2012) found that while the amount of both episodic and non-episodic detail reported in autobiographical memories increases between the ages of 8 and 16 years old, episodic detail increases at a much faster rate. The ratio of episodic to non-episodic details contained in autobiographical narratives, therefore, increases across development. Since episodic memory appears more strongly tied to other cognitive abilities than semantic memory (Levine et al., 2002; Wheeler et al., 1997), it may be uniquely vulnerable to

the detrimental effects of selective discussion, potentially leading to RIF for the episodic details reported in autobiographical memories but not for the semantic details. Moreover, as younger children report fewer episodic details than adolescents in their reports of autobiographical memories (Willoughby et al., 2012) and their episodic memory system is less developed (Wheeler et al., 1997), the episodic details reported in children's autobiographical memories may be more likely to be forgotten than the episodic details reported by adolescents.

Current Study

Our study investigates how selective discussion affects the amount of memory detail reported in non-discussed but recalled autobiographical memories, defined as both narrative coherence and internal and external details, and whether this differs for 8-9-year-old children and 13-15-year-old adolescents. We had two main hypotheses. First, we expected that RIF would be found for narrative coherence in children's but not adolescents' autobiographical memories; that is that children's RP- autobiographical memories would be less coherent than their NRP memories. We anticipated that this pattern would emerge for both global narrative coherence and thematic coherence, but we did not make specific predictions with regard to contextual or chronological coherence. Second, we hypothesised that RIF would be found for episodic detail in children's but not adolescents' autobiographical narratives; that is, children's RP- autobiographical memories would contain fewer episodic details than their NRP memories. These hypotheses are based on the premise that although both age groups show RIF for autobiographical memory recall (Glynn et al., 2018; see chapter 3), developmental differences may emerge with respect to retrieval of memory contents following selective discussion. Since non-episodic memory develops early in life and is a more robust form of memory than episodic memory (Levine et al., 2002; Wheeler et al., 1997), we did not expect to find RIF for non-

episodic details for either children or adolescents.

Method

Participants

Participants were 123 individuals from 2 age groups; children: 8-9 year olds (M = 9.13 years, SD = 0.50 years, n = 65), and adolescents: 13-15 year olds (M = 14.43 years, SD = 0.95 years, n = 58). Overall, 54.5% of the sample were female and 63.4% were of European ethnicity (11.4% Pacific Peoples, 8.1% Middle Eastern/Latin American/African, 7.3% Maori, 7.3% Asian, 2.4% Other). Participants were recruited from schools and youth groups in New Zealand. Consent was obtained from participants' parents (see Appendix A for example of letter) and young people gave verbal assent before taking part in the study.

Materials and Procedure

We administered an adapted version of Stone, Luminet, and Hirst's (2013) RIF paradigm for autobiographical memories (see Appendix B for full script). This paradigm had the following 5 phases: generation, learning, retrieval practice, distraction, and test. The RIF paradigm was administered in a single experimental session of approximately 30-45 minutes in duration and in the context of one-to-one interviews with the participant and the experimenter.

Generation. The experimenter asked participants to generate 12 memories of everyday events; 6 to the category cue "positive", and 6 to the cue "negative". The experimenter provided participants with examples of a positive ("When I won a competition") and negative ("When I had an argument with a friend") everyday memory and memories were generated alternating in valence, starting with positive memories. The experimenter also asked participants to generate a title for each memory (e.g. "Competition") and rate how the memory made them feel on a scale of 1 ("Very positive") to 5 ("Very negative").

Learning. The experimenter asked participants to listen carefully while she read their memories aloud, along with the memory's title and category cue (e.g. "Positive" - "Competition" - "When I won a competition"). The purpose of this phase was for participants to learn the association between the category-title-memory triad. Memories were read in the same order that they were generated; starting with a positive memory and then alternating between valences.

Retrieval Practice. For each participant, a selection of memories from one valence category was selected for retrieval practice, either positive or negative, and valence category was counterbalanced across participants. Three memories from the selected valence category were included in retrieval practice, and whether the selected memories were the first 3 generated or the last 3 generated was counterbalanced across participants, and termed RP+ memories. The remaining 3 memories of the same valence were termed RP- memories and memories of the alternative valence were termed NRP memories. During this phase, the experimenter read aloud the category cue and memory title and asked participants to recall the corresponding memory in as much detail as possible. Cues for each selected memory were presented to participants 3 times in a random order, such that the same memory was not directly repeated. In addition, each time a memory was recalled the experimenter asked participants to tell them first the causes of the event, then the consequences, and finally why the event is important (Stone et al., 2013), in order to encourage engagement with the recall task.

Distraction. Participants then spent 5 minutes engaged in a separate task that acted as a standardized delay between the retrieval practice and test phases. Children were provided with pictures to copy from one grid to another and adolescents were provided with crossword puzzles, sudoku puzzles or coloured pictures.

Test. The experimenter then asked participants to recall as many memories from the

generation phase as possible. Recall started with one valence category and continued until participants could not recall any more memories from this category, before switching to the other valence category. Whether recall began with positive or negative memories was counterbalanced across participants. Participants were thanked for their participation and given a small gift.

Coding

Participants' average narrative length ranged from 7.50-168.17 words. An independent samples t-test revealed that overall, there was no significant difference in the length of 8-9-year-old's narratives and 13-15-year-old's narratives. In consultation with the coding scheme developers, the length of the narratives generated in this experiment were deemed appropriate for the coding schemes selected, as they were comparable in length to others that had used the schemes.

Narrative Coherence. The memories produced by participants in the generation, retrieval practice, and test phases of the RIF paradigm were coded for narrative coherence using Reese et al.'s (2011) Narrative Coherence Coding Scheme (NaCCS; see Appendix D for full coding scheme). The NaCCS uses global rating scales from 0-3 to quantify the level of coherence for each of the 3 dimensions of narrative coherence; context, chronology, and theme. Low scores for contextual coherence reflect narratives that do not orient the listener with regard to time and place or where orientation is vague, whereas high scores reflect narratives that are clear in their orientation of both time and place. Low scores for chronology coherence reflect narratives that provide very little ordering of events, whereas high scores reflect narratives where most events can be ordered along a timeline. Finally, low scores for thematic coherence reflect narratives that are largely off-topic or do not elaborate on the theme of the narrative, whereas high scores reflect narratives that substantially develop the theme of the narrative and include a

resolution. Due to difficulties obtaining interrater reliability on the thematic coherence dimension, this scale was expanded to include more specificity in theme elaboration. The theme coherence dimension was then transformed back to a 4-point scale for data analysis. Each memory received a narrative coherence score for each of the 3 dimensions. An average global coherence score was then calculated from the summed scores of each coherence dimension. A primary coder coded 100% of the memories, 25% were coded by an independent secondary coder, and intra-class correlations (ICC) were calculated. ICCs for context, chronology, and theme coherence were .86, .85, and .89, respectively.

Internal and External Detail. Addis, Wong, and Schacter's (2008) adaptation of the internal external coding scheme was utilized to capture the extent of episodic and non-episodic detail present in each memory at the generation, retrieval practice, and test phases (see Appendix E for full coding scheme). First, the *main event* in each narrative was identified, defined as a specific and single event with a duration of one day or less and in which the individual was involved. Memory details were then coded under the broad categories of *internal* or *external.*

Internal details were related to the main event and can be conceptualised as experiential details. Each internal detail was further categorised into one of 5 categories: e*vent details* which describe the unfolding of the story pertaining to the main event, including actions, people present, and emotional reactions, *place details* which included any information that located the event in space, *time details* which included any information that located the event in time, *perceptual details* which included any visual, olfactory, tactile, taste, or auditory details, and *emotions/thought details* defined as information pertaining to the mental state of the subject at the time of the event, such as feeling states, opinions, expectations and beliefs.

External details were defined as either episodic or semantic information that was not

related to the main event. Each external detail was further categorised into one of 5 categories: *semantic details* defined as general knowledge or facts about either the situation or the subject, *repetitions* defined as unsolicited repetitions of previously included information, *other details* which included details that do not reflect recollection, such as comments to the experiments, meta-cognitive statements and inferences, *external event detail* defined as episodic events that are secondary to the *main event,* and *generic events/routines* defined as repeated or routine events. Details from each of the *internal* and *external* categories were tallied and summed to provide a total score for each overarching category. All memories were coded by a primary coder and a secondary coder independently coded 25% of the memories to determine inter-rater reliability. For internal details ICC = .94, and for external details ICC = .88.

Results

Manipulation Checks at the Generation Phase

As the data were not normally distributed, bootstrapping was conducted where appropriate. Participants rated the emotional valence of their memories on a 5-point scale (1 = *very positive*, 3 = *neither positive nor negative*, 5 = *very negative*). A paired samples t-test indicated that memories generated to the cue positive (M = 1.47, SD = 0.51) were rated as significantly more positive than memories generated to the cue negative (M = 3.97, SD = 0.42), $t(122) = 38.75$, $p < .001$, CI [-2.63, -2.36].

Baseline Narrative Coherence and Internal and External Details Across RP Categories. We conducted paired samples t-tests to investigate differences in narrative coherence and internal and external details for gender, ethnicity, and retrieval practice category at the generation phase. For both children and adolescents, there were no significant differences in the level of narrative coherence or external details between each of the retrieval practice

categories (all *t*s: 0.29-1.81, all *p*s: .08-.78; see Table 3 and 4 for descriptive statistics), indicating that baseline levels of narrative coherence for each retrieval practice category did not influence the RIF effect. For internal details, RP- memories were significantly shorter than RP+ memories, $t(122) = 2.31$, $p = .02$, but not significantly differ from NRP memories ($t = 1.40$, $p = .16$), indicating that baseline levels of detail did not influence the RIF effect. In addition, gender and ethnicity factors did not influence the main findings (all *F*s = 0.003-1.92, all *p*s = .07-.96).

	Generation			Retrieval Practice	Test		
	RP+	RP-	NRP	RP+	RP+	RP-	NRP
Context	1.05 (0.56)	1.00 (0.57)	1.04 (0.52)	0.88 (0.49)	0.73 (0.64)	0.48 (0.60)	2.14 (1.63)
Chronology	0.57 (0.68)	0.48 (0.57)	0.44 (0.52)	0.41 (0.50)	0.30 (0.60)	0.36 (0.84)	0.34 (0.57)
Theme	1.89 (0.50)	1.94 (0.48)	1.88 (0.45)	2.02 (0.34)	1.55 (0.54)	1.27 (0.79)	1.55 (0.51)
Global	1.17 (0.40)	1.14 (0.39)	1.12 (0.37)	1.10 (0.28)	0.86 (0.42)	0.71 (0.53)	1.34 (0.68)
Internal	9.26 (7.01)	9.69 (6.17)	10.44 (7.40)	8.88 (5.85)	7.70 (6.80)	6.05 (7.69)	7.86 (6.73)
External	3.05 (3.83)	2.88 (3.98)	2.73 (2.93)	2.93 (2.93)	1.64 (3.13)	0.97 (1.78)	1.28 (2.07)

Table 3. Descriptive statistics for narrative coherence dimensions and internal and external details in 8-9-year-old children's autobiographical memories at the generation, retrieval practice, and test phases of the RIF paradigm.

	Generation			Retrieval Practice	Test		
	RP+	RP-	NRP	RP+	RP+	RP-	NRP
Context	1.11 (0.51)	1.12 (0.55)	1.12 (0.43)	0.98 (0.46)	0.84 (0.56)	0.86 (0.64)	0.92 (0.41)
Chronology	0.39 (0.55)	0.48 (0.52)	0.51 (0.52)	0.51 (0.53)	0.36 (0.61)	0.35 (0.64)	0.34 (0.50)
Theme	1.98 (0.48)	2.02 (0.42)	1.76 (0.58)	2.16 (0.40)	1.69 (0.74)	1.78 (0.53)	1.16 (0.33)
Global	1.16 (0.35)	1.21 (0.38)	1.22 (0.30)	1.22 (0.34)	0.99 (0.40)	0.97 (0.49)	1.01 (0.35)
Internal	9.97 (4.63)	9.88 (4.85)	10.35 (4.23)	10.28 (5.46)	8.43 (5.84)	7.53 (6.07)	8.98 (6.28)
External	0.45 (0.97)	0.37 (0.94)	0.30 (0.62)	4.85 (4.42)	1.83 (2.07)	1.72 (2.15)	1.56 (1.84)

Table 4. Descriptive statistics for narrative coherence dimensions and internal and external details in 13-15-year-old adolescents' autobiographical memories at the generation, retrieval practice, and test phases of the RIF paradigm.

Baseline Narrative Coherence and Internal and External Details Across Development. In order to establish the expected increases in narrative coherence with age, a series of 2 (Valence: positive, negative) x 2 (Age: children, adolescents) mixed model and one-way between groups ANOVAs were conducted both globally and for each dimension of narrative coherence, as well as for internal and external details at both the generation phase and retrieval practice phases of the RIF paradigm (see Table 3 and 4 for descriptive statistics). Unexpectedly, most variables did not significantly differ between the two age groups. At the generation phase, thematic coherence for positive memories only was significantly greater for adolescents than for children, $t(121) = 2.50$, $p = .01$. At the retrieval practice phase levels of thematic, $t(121) = 4.61$, $p < .001$, and global, $t(121) = 2.01$, $p = .05$, coherence were significantly greater for adolescents than children. There were no significant differences in the amount of contextual and chronological coherence or internal and external detail reported by children and adolescents in either the generation or retrieval practice phase (all Fs = 0.26-2.29, all ps = .30-.65).

Manipulation Checks at the Test Phase

Memories at the test phase were scored as correct if they contained enough information to be unambiguously matched to a memory in the generation phase. We conducted a series of mixed model ANOVAs to test for effects of recall order, gender and ethnicity. There were no significant interactions with RP category for narrative coherence (Fs: 0.03-2.20, ps: .11-.97) or internal and external details (all Fs: 0.29-1.92, all ps: .13-.99), indicating that neither recall order, ethnicity, nor gender influenced the RIF effect.

Output Interference. We utilized Macrae and Roseveare's (2002) procedure for ranking recall order to eliminate output interference as an explanation. We conducted a series of 3 (RP category: RP+, RP-, NRP) x 2 (Age: children, adolescents) x 2 (Output order: early RP+, early RP-) mixed model ANOVAs for each memory detail variable. For chronology

coherence, theme coherence, and internal and external detail, neither the main effect of output order nor the interactions between output order, age group, and RP category were significant (Fs = 0.01-7.50, ps = .24-.96). For context coherence, however, the interaction between RP category and output order was significant, $F(2, 206) = 23.21$, $p < .001$, $\eta = .18$. Follow up independent samples t-tests indicated that while levels of context coherence did not differ for RP+ narratives, when RP+ memories were recalled earlier, RP- memories were significantly less coherent, $t(105) = 2.56$, $p = .01$, CI [-.54, -.07] and NRP memories were significantly more coherent, $t(105) = 4.69$, $p < .001$, CI [0.64, 1.59] than when RP- memories were recalled earlier. While output interference is unlikely to have influenced the RIF effect for chronology coherence, thematic coherence, or internal and external details, RIF findings for context coherence may be influenced by output order.

Hypothesis 1: RIF for Narrative Coherence

To test our first hypothesis, that we would find RIF for global and thematic narrative coherence for children's but not adolescents' autobiographical memories, we conducted a 3 (RP category: RP+, RP-, NRP) x 2 (Valence: positive, negative) x 2 (Age: children, adolescents) x 4 (Coherence dimension: global, context, chronology, theme) mixed model ANOVA. There was a significant interaction between retrieval practice category, coherence dimension and age group, $F(6, 714) = 19.69$, $p < .001$, $\eta = .14$.

Follow up paired samples t-tests for each coherence dimension were conducted separately for the children and adolescents (see Table 3 and 4 for descriptive statistics). Alpha adjustments were not applied, as each coherence dimension were distinct data. For children, there were significant differences amongst the levels of global, context, and thematic coherence, such that RP+ narratives were significantly more globally, $t(64) = 2.10$, $p = .04$, contextually, $t(64) = 2.72$, $p = .01$, and thematically, $t(64) = 2.35$, $p = .02$ coherent than RP- narratives. In addition, NRP memories were significantly more contextually coherent,

$t(64) = 6.56$, $p < .001$, but significantly less globally coherent, $t(64) = 5.90$, $p < .001$, than RP+ memories. Finally, RP- narratives were significantly less globally, $t(64) = 7.12$, $p < .001$, contextually, $t(64) = 7.74$, $p < .001$, and thematically, $t(64) = 2.36$, $p = .02$, coherent than NRP narratives. There were no significant differences in the levels of chronology coherence between the retrieval practice categories for children (all ts = 0.31-0.51, all ps = .61-.76). For adolescents, there were no significant differences in the levels of narrative coherence in each retrieval practice category for any of the dimensions (all ts = 0.14-1.06, all ps = .29-.89).

In sum, our first hypothesis, that we would find RIF for global and thematic coherence in the narratives of children but not adolescents, was supported. We found RIF for global, thematic, and contextual coherence in the narratives of children, whereas adolescents did not display RIF for any coherence dimension.

Hypothesis 2: RIF for Episodic and Non-Episodic Detail

In order to test our second hypothesis, that we would find RIF for internal details for children but not adolescents' autobiographical memories, and that we would not find RIF for external details for either children or adolescents' memories, we conducted a 3 (RP category: RP+, RP-, NRP) x 2 (Detail: internal, external) x 2 (Valence: positive, negative) x 2 (Age: children, adolescents) mixed model ANOVA. There were no significant interactions with either valence or age, but the interaction between retrieval practice category and detail was significant, $F(2, 238) = 37.95$, $p = .04$, $\eta^2 = .03$. Paired samples t-tests were conducted to investigate the amount of internal and external detail in the memories in each of the retrieval practice categories. RP+ memories contained significantly more internal details than RP- memories, $t(122) = 2.00$, $p = .05$. In addition, RP- memories contained significantly fewer internal details than NRP memories, $t(122) = 3.13$, $p = .002$. There were no significant differences in the number of external details in each of the retrieval practice categories (all ts = 0.42-1.63, all ps = .11-.68).

Our second hypothesis, that we would find RIF for children's internal, but not external memory details, and that we would not find RIF either internal or external details with adolescents, was partially supported. Consistent with our hypothesis, we did not find RIF for external details with either children or adolescents. In addition, we found RIF for internal details with children's autobiographical memories, but, contrary to our hypothesis, we also found that adolescents displayed RIF for internal memory details.

Discussion

Most studies investigating the impact of selective discussion on future recall have defined RIF as the presence or absence of a non-discussed memory; if it is present it is recalled and if it is absent it is forgotten (Anderson et al., 1994). It is possible, however, that the effect of selective discussion results in memory impairments even when non-discussed memories are recalled (e.g. Glynn et al., 2018; Wessel & Hauer, 2006). The first aim of our study, therefore, was to investigate the impact of selective discussion on non-discussed but recalled positive and negative autobiographical memories by analysing RIF for memory detail, which we conceptualised both as narrative coherence (Reese et al., 2011) and as episodic and non-episodic memory detail (Addis et al., 2008). Across childhood and adolescence, both the quantity (Willoughby et al., 2012) and quality (Habermas & Reese, 2015) of the details included in autobiographical memories increases. In light of these developmental findings, the second aim of our study was to investigate whether selective discussion would differentially impact the autobiographical memory details provided by 8-9-year-old and 13-15-year-old young people. First, we hypothesised that children, but not adolescents, would show RIF for theme and global coherence; that is, children's RP- memories would be less thematically and globally coherent than their NRP memories. Second, we hypothesised that children, but not adolescents, would show RIF for episodic details and that neither children nor adolescents would display RIF for non-episodic memory

details. The rationale for these hypotheses was that children would be less competent in constructing coherent narratives than adolescents (Reese et al., 2011) and report fewer episodic details (Willoughby et a., 2012) and therefore children's memory details may be more susceptible to RIF than adolescents'.

In support of our first hypothesis, we found RIF for global and thematic narrative coherence for children's, but not adolescents', autobiographical memories. We did not make specific predictions about context and chronology coherence, but we also found RIF for children's contextual coherence. Our finding for contextual coherence is tentative, however, as output interference could not be ruled out as a potential cause of the RIF effect. Our findings indicate that not talking about a selection of autobiographical memories when similar memories are discussed impairs 8-9-year-old children's ability to form coherently structured narratives. Since narratives that are structured more coherently are more likely to be recalled in future (Morris et al., 2010), selective discussion may lead to children forgetting non-discussed memories over time, even when they are initially recalled. In combination with our previous findings (Glynn et al., 2018), our current findings suggest that selective discussion may impair children's ability to recall their non-discussed autobiographical memories both directly and indirectly. In sum, our findings suggest that selective discussion differentially impacts the memories of children and adolescents with regard to narrative coherence and that children's autobiographical memories may be uniquely vulnerable to forgetting following selective discussion, in a way that adolescents' memories are not.

As explained by the response-competition inhibition theory of RIF (Anderson et al., 1994), our findings for narrative coherence indicate that inhibition may impact RP- memories differently across development, such that children's memories are more vulnerable than adolescents' to the effects of inhibition on later narrative construction. From mid-childhood to mid-adolescence many neural and socio-cognitive changes occur (Dahl, Allen, Wilbrecht,

& Suleiman, 2018), including developmental increases in working memory and attentional capacity (Ernst & Mueller, 2007). In addition, adolescents are better practised than children in coherently structuring their narratives (Habermas & Reese, 2015) and producing a coherent narrative may require fewer cognitive resources for adolescents than children. It is possible that these developmental changes interact with the inhibitory process implicated in RIF, resulting in a diminished inhibitory effect on the narrative coherence of adolescents' RP-memories in comparison children's.

In partial support of our second hypothesis, we found RIF for episodic details for both children's and adolescents' autobiographical memories. In addition, we did not find RIF for non-episodic details for either children or adolescents. This finding is consistent with others indicating that episodic memory details are vulnerable to forgetting in ways that non-episodic memory details are not (Levine et al., 2002; Murphy, Troyer, Levine, & Moscovitch, 2008; Söderlund et al., 2014). Since the ability to re-experience past events is unique to episodic memory (Tulving, 2002), our findings suggest that selective discussion may impair young people's ability to engage in mental time travel and re-create their experiences, and they may instead rely on semantic information and self-knowledge to reconstruct their non-discussed memories. Findings with children indicate that including rich episodic detail in conversations about autobiographical memories is associated with increased long-term memory retention (Jack, MacDonald, Reese, & Hayne, 2009; Reese, Jack, & White, 2010). Selective discussion may, therefore, detrimentally impact young people's long-term recall of their non-discussed experiences.

Contrary to our second hypothesis, we did not find a developmental difference in the way selective discussion impacts the episodic memories of children and adolescents. Episodic memory details may, therefore, be vulnerable to being forgotten from non-discussed memories across development, despite the developmental increases in the quantity of

episodic detail reported in autobiographical memories (Willoughby et al., 2012). Although not explicitly conceptualised as such, the detail provided by the adults in Wessel and Hauer's (2006) study can be classified as largely episodic, as it pertains to *what*, *where*, and *when* information (Tulving, 2002). Thus, their findings may indicate that the episodic details in adults' non-discussed memories are also vulnerable to being forgotten following selective discussion. In order to better understand the developmental impact of selective discussion of autobiographical memories on recall of episodic details, future studies should measure episodic detail consistently across development and include a wider age range, extending up to adulthood.

It should be noted that we did not consistently find the expected increases in memory details between children and adolescents. Previous studies have indicated that narrative coherence, particularly theme coherence, significantly increases between mid-childhood and mid-adolescence (Reese et al., 2011). While we found that adolescents' memories contained higher levels of thematic coherence than children's memories at both the generation and retrieval practice phases of the paradigm, we only found significant increases in global coherence at the retrieval practice phase, and we did not find any differences in contextual or chronological coherence between the two age groups. In addition, increases in both episodic and non-episodic details have been found between childhood and adolescence, with episodic details increasing at a faster rate than non-episodic details (Willoughby et al., 2012). In our study, there were no significant differences in the amount of either episodic or non-episodic details reported by children and adolescents. For both narrative coherence and episodic detail, however, descriptive statistics show that mean levels of most memory detail indices were higher in adolescence than in childhood (see Table 3 and 4). Thus, although small and statistically non-significant, our general pattern of findings is broadly consistent with expected developmental increases in memory detail.

In explaining our failure to replicate developmental increases in memory details, one possibility lies in the nature of the autobiographical memory recall task. Unlike many studies investigating the qualities of children and adolescents' autobiographical memories, in which only one or two particularly significant events are recalled (e.g. Chen, McAnally, Wang, & Reese, 2012; Willoughby et al., 2012), participants in our study were asked to provide 12 "everyday" memories, which may not have best captured their ability to recall detailed memories. It is possible, for instance, that the adolescents in our sample prioritised task demands to produce a high volume of memories in a short timeframe at the expense of providing highly detailed accounts of their experiences.

The findings of this study build on our previous work (Glynn et al., 2018) in two important ways. First, we have identified what kind of information is vulnerable to being forgotten from children's autobiographical memories. While our previous study found that selective discussion of 8-9-year-old children's autobiographical memories results in RP- memories being recalled in sparser detail, we now know that recall of episodic detail is diminished, while recall non-episodic detail is not impaired. In addition, children's ability to provide a coherent account of their experiences, specifically with regard to orienting the listener to time and place and elaborating on a consistent theme, is impaired for RP- memories.

Second, while our previous study only included one age group, we investigated developmental patterns in RIF for autobiographical memory detail, finding that although selective discussion impairs recall of memory detail in the RP- memories of both 8-9-year-old children and 13-15-year-old adolescents, the specific impact of selective discussion differs for children and adolescents. Children's RP- memories appear to be more vulnerable to the effects of selective discussion than adolescents, as both children's recall of episodic detail and their ability to coherently structure their narratives are impaired. Selective

discussion of adolescents' memories, on the other hand, only impacts their recall of episodic memory details, and does not impair their ability to coherently structure their narratives. This finding is contrary to the majority of studies investigating RIF across development that have found no differences across age (e.g. Ford et al., 2004; Lechuga et al., 2006), and suggests that, in comparison to adolescents, not discussing a selection of autobiographical memories is particularly detrimental to children's recall of detailed memories.

Given that most autobiographical memory research is carried out in separate and isolated silos stemming from distinct theoretical backgrounds (Graci et al., 2018), a particular strength of our study is that we have woven together insights about autobiographical memory from two theoretical perspectives (Nelson & Fivush, 2004; Tulving, 1984, 2002). This approach enabled us to make distinctions about which kinds of memory detail are more and less vulnerable to being forgotten following selective discussion, finding that the answer is dependent on age. Approaches originating from both the socio-cultural developmental theory (Nelson & Fivush, 2004) and the cognitive systems theory (Tulving, 2002) of autobiographical memory appear similar in some ways, for instance they both provide a measure of autobiographical memory form and contents (Addis et al., 2008; Reese et al., 2011) and increase over development from childhood to late adolescence (Habermas & Reese, 2015; Willoughby et al., 2012). Our findings suggest that narrative coherence and episodic detail may not be two sides of the same coin but are distinct constructs, as, across development, they appear to be differentially impacted by cognitive processes such as inhibition. One of the potential benefits of such wide research interest in autobiographical memory, therefore, is that many related, yet distinct, constructs may have been identified. Future research should continue to draw together these constructs in order to gain a richer understanding of how autobiographical memory operates across development.

Chapter 5

General Discussion

The overarching aim of this thesis was to investigate the impact of selective discussion of autobiographical memories on young people's recall of their discussed and non-discussed memories. Specifically, in three empirical studies, we investigated whether selective discussion of young people's autobiographical memories leads to non-discussed memories, that are similar in terms of valence, being forgotten; whether selective discussion has a long-term impact on young people's recall of their autobiographical memories; and whether selective discussion impairs young people's recall of similar, non-discussed autobiographical memory details and whether this differs for children and adolescents. In this chapter, I outline the main findings from each study and discuss the ways in which they add to our understanding of how talking and not talking with young people about autobiographical memories influences how they remember their experiences. I then discuss the theoretical implications of our findings, specifically with regard to the response-competition inhibition account of RIF (Anderson, Bjork, & Bjork, 1994), and suggest some avenues for future research.

RIF for Young People's Autobiographical Memories

Conversations about autobiographical memories with young people are crucial for their autobiographical memory and socio-cognitive development (Nelson & Fivush, 2004). These conversations are selective, such that some events are discussed at the expense of others. It is, therefore, important to consider the fate of memories not discussed and how this may influence memory development. Researchers have adopted the RIF paradigm to investigate the impact of selective discussion of autobiographical memories for adults' recall of their experiences (e.g. Barnier, Hung, & Conway, 2004; Wessel & Hauer, 2006), but the quality of autobiographical memories dramatically improves from childhood to adulthood

(Habermas & Reese, 2015), and this may mean that selective discussion does not impact the memories of young people and adults in the same way. In Study 1, therefore, we used an adapted version of Stone, Luminet, and Hirst's (2013) paradigm, designed to investigate RIF for adults' autobiographical memories, to investigate whether selective discussion of 8-9-year-old children's self-generated autobiographical memories would lead to RIF. We found that, after discussing a selection of autobiographical memories, children recalled a smaller proportion of RP- memories in comparison to NRP memories, indicating that selective discussion had produced RIF. This pattern is consistent with other findings indicating that selective review with children from as young as 5-years-old produces RIF for non-reviewed material (e.g. Aslan & Bäuml, 2010; Conroy & Salmon, 2005, 2006; Lechuga, Moreno, Pelegrina, Gómez-Ariza, & Bajo, 2006).

Although on the surface it may appear that our findings with children's autobiographical memories mirror those found with adults (e.g. Barrier et al., 2004), delving deeper may reveal subtle developmental differences. Unlike many studies with adults in which RIF was found for negative autobiographical memories only (e.g. García-Bajos & Migueles, 2017; Harris, Sharman, Barnier, & Moulds, 2010; Wessel & Hauer, 2006), in Study 1 we found RIF for 8-9-year-old children's positive and negative autobiographical memories. In Study 2, therefore, we investigated whether selective discussion of 13-15-year-old adolescents' positive and negative autobiographical memories would lead to RIF. Adolescence is a unique developmental period, a time when rapid and non-linear neural, biological, and socio-cognitive changes occur (Dahl, Allen, Wilbrecht, & Suleiman, 2018), resulting in marked advances in some domains and temporary regressions in others (Blakemore & Choudhury, 2006). It is important to investigate cognitive processes such as RIF in adolescence, without assuming that adolescence functions as a homogeneous "developmental bridge" from childhood to adulthood (Zimmermann & Iwanski, 2018). We

found that selective discussion of adolescents' autobiographical memories leads to RIF for negative memories only. In this regard, it appears that RIF for adolescents' autobiographical memories more closely resembles RIF patterns found with adults (e.g. García-Bajos & Migueles, 2017; Harris et al., 2010; Wessel & Hauer, 2006) than with 8-9-year-old children.

Some researchers have suggested that this RIF valence effect found with adults' autobiographical memories may be tied to "positivity memory bias", which is present in early to mid-adulthood (Walker, Skowronski, & Thompson, 2003), strengthens into older adulthood (Mather & Carstensen, 2005), but is absent in infancy (Vaish, Grossmann, & Woodward, 2013). It is, therefore, possible that a RIF valence effect for autobiographical memories emerges across development as a product of this strengthening positivity memory bias. In this case, our findings may suggest that the positivity bias is present in the memories of 13-15-year-old adolescents. On one level, our findings from Study 1 and 2 indicate that selective discussion with young people's autobiographical memories leads to RIF. Our findings also highlight the importance of digging below the surface to uncover developmental differences that may not initially appear evident.

Duration of RIF

In Study 2 we also investigated whether the RIF effect endures for longer than a single experimental session by adding a follow-up test which was administered to 13-15-year-old adolescents the day after the initial RIF procedure was administered. Using self-generated autobiographical memories as RIF stimuli was one way to increase the ecological validity of RIF findings, as this design more closely resembles the content of real-world conversations about experienced events. It is also important, however, to investigate the duration of the RIF effect following selective discussion in order to determine whether RIF is purely a laboratory phenomenon or whether it is likely to have enduring effects in the real world. Consistent with other studies that have found that RIF persists over an extended delay

(e.g. García-Bajos, Migueles, and Anderson; 2009; Migueles & García-Bajos, 2007), we found that for negatively valenced autobiographical memories, the RIF effect persisted over the 1-day delay, indicating that selective discussion impacts adolescents' ability to recall non-discussed autobiographical memories for at least 1 day.

Study 2 findings also indicated that, although selective discussion did not produce RIF for positive autobiographical memories after a short delay of 5 minutes, after a longer, 1-day delay, RIF for adolescents' positive memories emerged. In light of the previously-discussed developmental findings for the positivity memory bias, this finding for positive autobiographical memories could signal that the positivity bias is only weakly operational for 13-15-year-old adolescents; it may function to protect positive RP- memories from being forgotten over a short delay but is not sufficiently strong as to protect them from being forgotten following a longer delay. That RIF for positive autobiographical memories emerged after a longer delay period than RIF for negatively valenced autobiographical memories also raises the possibility that RIF for different kinds of stimuli may emerge over different delay periods. Thus, in cases where RIF does not immediately appear following selective discussion, an extended delay period may be required in order to capture RIF.

RIF for Young People's Autobiographical Memory Details

Autobiographical memories are complex; they contain rich, vivid details about unique and personal experiences, situate events in context, and contain personal evaluations of experiences (Reese et al., 2011; Tulving, 2002). Selective discussion may impact these kinds of memory qualities of non-discussed autobiographical memories even when memories are recalled. Traditional conceptualisations of RIF as the presence or absence of a memory are suitable for simple stimuli such as word pairs, but do not allow investigations of the wider impact of selective discussion on autobiographical memory. In Study 1 we investigated whether selective discussion impaired 8-9-year-old children's ability to recall the details of

their non-discussed memories. We broadly defined memory details as "total meaningful words" in order to maximise our ability to capture any impact selective discussion may have on recall of autobiographical memory details. We found that children's RP- memories contained fewer memory details than their NRP memories, indicating RIF for children's autobiographical memory details. This study demonstrated that selective discussion with children impairs RP- memories even when they are recalled, such that they are recalled in sparser detail than NRP memories.

While the findings of Study 1 indicated that memory details were lost from RP- memories, we could not identify what kind of details were vulnerable to being forgotten following selective discussion due to the breadth of the memory detail measure. In Study 3, therefore, we expanded on the findings of Study 1 in two ways. First, rather than defining memory detail "total meaningful words", we used two specific and more fine-grained measures of memory detail; narrative coherence (Reese et al., 2011) and episodic and non-episodic information (Addis, Wong, & Schacter, 2008). Second, we combined the Study 1 and Study 2 samples and investigated whether the impact of selective discussion on young people's autobiographical memories differed for 8-9-year-old children and 13-15-year-old adolescents. We found that when non-discussed memories were recalled, selective discussion impaired young people's ability to recall the autobiographical memory details for non-discussed memories. Contrary to other findings that RIF does not differ across development (Aslan & Bäuml, 2010; Lechuga et al., 2006), we found that the ways in which autobiographical memory details were impacted following selective discussion was different for 8-9-year-old and 13-15-year-old young people. Selective discussion impaired 8-9-year-old children's ability to structure their non-discussed memories coherently, and also impaired their recall of episodic memory details, whereas selective discussion impaired 13-15-year-old adolescents' recall of episodic memory details, but did not influence their ability to

coherently structure their narratives. Thus, 8-9-year-old children's autobiographical memories appear to be more vulnerable to the effects of selective discussion than 13-15-year-old adolescents' memories.

Memories that are not coherently structured (Morris, Baker-Ward, & Bauer, 2010) and contain sparse episodic detail (Jack, MacDonald, Reese, & Hayne, 2009; Reese, Jack, & White, 2010) are less likely to be recalled in future. Our findings suggest that not only are RP- memories immediately more likely to be forgotten following selective discussion but that even when they are recalled they contain fewer episodic memory details and children's memories are structured less coherently. This, in turn, makes these memories more vulnerable to being forgotten in future. We are able to build on the existing understanding of how selective discussion influences recall, and our findings highlight the importance of taking a more nuanced approach to RIF when using stimuli such as autobiographical memories, which are richer and more complex than word pair stimuli. Our Study 3 findings demonstrate that while some RIF findings are consistent across development, others differ and, taken together with our memory valence findings in Study 1 and 2, suggest that developmental differences in RIF may be subtle but nonetheless significant.

Study 3 was the first study in the field to investigate what kind of memory details are vulnerable to being forgotten from non-discussed memories following selective discussion. We found that not all memories details are impacted alike; the chronological coherence of, and the amount of non-episodic detail reported in, non-discussed memories were not affected for either children or adolescents. Since chronological coherence is the first dimension of coherence to develop (Reese et al., 2011), it is possible that 8-9-year-old children were sufficiently competent in producing chronologically coherent narratives that their ability to do so was not impacted by selective discussion. Contextual and thematic coherence, on the other hand, may not yet be mastered by these children, and, therefore, selective discussion

may have impaired their ability to remember to structure their narratives in a contextually and thematically coherent way. Our finding that episodic, but not non-episodic, memory details were forgotten following selective discussion is consistent with other findings that episodic memory details are uniquely vulnerable to memory impairments (Levine, Svoboda, Hay, Winocur, & Moscovitch, 2002; Murphy, Troyer, Levine, & Moscovitch, 2008; Söderlund et al., 2014). In this study, we opted to use measures of memory detail that have emerged from two different theories of autobiographical memory. Therefore, we could analyse autobiographical memories from two related but distinct angles and were able to draw together findings from two otherwise distinct areas of autobiographical memory research.

In Study 1, we also investigated whether the amount of memory detail reported by children during the retrieval practice phase of the RIF paradigm was related to the magnitude of RIF found at the test phase. Again, we used a broad and sensitive definition of memory detail as "total meaningful words" in order to ascertain whether RIF magnitude is influenced by any kind of memory detail in the first instance. We found that children who reported greater amounts of memory detail during retrieval practice forgot a greater proportion of RP- memories relative to NRP memories; that is, reporting highly detailed memories during retrieval practice enhances the RIF effect. Our finding with 8-9-year-old children is contrary to Barnier et al.'s (2004) findings with adults, which may indicate another developmental difference in RIF for autobiographical memories. Alternatively, since Barnier et al. (2004) used a more restricted definition of memory detail, we may have identified a more subtle effect not captured by their measure. Our findings indicate memory detail is implicated in the RIF process in two ways; not only does selective discussion impact children's ability to recall their non-discussed memories in detail, but reporting RP+ memories in more detail during retrieval practice increases the extent to which RP- memories are forgotten. Thus, our findings across Study 1 and 3 clearly highlight the important role that memory detail plays in

RIF for children and adolescents' autobiographical memories, which has been largely overlooked by studies investigating RIF for autobiographical memories.

In summary, we found that selective discussion led to RIF for children's autobiographical memory details, defined as total meaningful words, narrative coherence, and episodic information. In addition, we found that selective discussion led to RIF for adolescents' memory details, defined as episodic information. This represents a key developmental difference in the impact of selective discussion for children and adolescents' recall of their autobiographical memories and suggests that children's memory details are more vulnerable than adolescents' to being forgotten. Finally, we also found that children who report more memory details during retrieval practice forget a greater proportion of their non-discussed autobiographical memories, highlighting an additional way in which memory detail is implicated in the RIF process for children.

Theoretical Implications

Although we did not directly test the mechanism underlying RIF, our findings have a number of theoretical implications with regard to the response-competition inhibition theory of RIF (Anderson et al., 1994). The findings from Study 1 and 2, that selective discussion with both 8-9-year-old children and 13-15-year-old adolescents produces RIF for non-discussed autobiographical memories, may indicate that at a fundamental level, the same inhibitory mechanism operating on adults' autobiographical memories also functions to make young people's RP- memories, making them harder to retrieve. Other developmental findings also indicate that the inhibition that underlies RIF does not differ across development and, as such, provides support for the theory that this inhibition is an automatic process (Lechuga et al., 2006). While this may accurately describe the developmental impact of RIF for autobiographical memories at the most basic level, our broader pattern of findings indicates that age-related differences in RIF exist when investigating more nuanced RIF patterns.

The first developmental theoretical implication is that inhibition may differentially affect the positive memories of children and adolescents, as our findings showed that selective discussion produced RIF for children's positive and negative memories but only produced RIF for adolescents' negative memories. Adolescents' positive memories may be protected from being forgotten after selective discussion whereas children's positive memories are not. Stimuli integration has been identified as a buffer to the inhibitory mechanism underlying RIF, such that stimuli that are more connected with one another are less likely to be forgotten following retrieval practice (Anderson, 2003). This pattern is theoretically caused by increased competition between stimuli, so that even when RP- memories are successfully inhibited during retrieval practice, the inhibition does not have enduring effects and RP- memories are not as likely to be forgotten at the test. In light of this theory, it is possible that adolescents' positive memories are more strongly integrated with one another than children's positive memories. Developmental findings indicate that children tend to recall both their positive and negative memories as distinct, detailed, and unique events, whereas adolescents recall negative memories as unique and distinct events, but begin to view their positive memories as events that make up their life story (Holland & Kensinger, 2010). Adolescents' positive memories may become connected, as part of a timeline of their life, in a way that their negative memories may not. This could result in adolescents' positive memories becoming more highly integrated than their negative memories, and more integrated than both the positive and negative memories of children, and contribute towards this developmental difference in RIF for autobiographical memories.

The second developmental theoretical implication of our findings is that inhibition may differentially affect the details of children's and adolescents' autobiographical memories. Our findings indicated that selective discussion produced RIF for children's, but not adolescent's, narrative coherence. The ability to coherently structure personal narratives

improves across development from childhood to early adulthood (Habermas & Reese, 2015). Moreover, coherently structuring narratives may be a more effortful task for children than adolescents, as not only are they less well practised but they also have fewer working memory resources available to hold the details of their memories throughout the duration of the RIF procedure (Ernst & Mueller, 2007). Thus, the extent to which inhibition causes some autobiographical memory details to be forgotten may be dependent on a person's skill in communicating their memories with such detail.

In addition to these developmental insights about inhibition, our research also produced insights into how RIF may operate over time. In Study 2 we found RIF for adolescents' positive autobiographical memories only after a 1-day delay and not after a 5-minute delay, indicating that inhibition may have at least a short-term enduring effect on RP- memories even when they are initially recalled. If adolescents' positive autobiographical memories are more strongly integrated with one another, this finding suggests that stimuli integration may slow the process of RIF rather than mitigating the effect of inhibition altogether. It also highlights the necessity of longer-term follow up tests, in order to understand how the inhibition produced by selective retrieval practice affects memories over time.

In summary, our findings that RIF differed over development with regard to memory valence and details indicate that there may be subtle differences in the way inhibition affects the memories of children and adolescents. In addition, the length of time it takes for the effects of inhibition to cause non-discussed memories to be forgotten may differ for different kinds of stimuli.

Future Research

The research conducted in this thesis constitutes an important first step in determining *how* selective discussion influences young people's ability to recall their autobiographical

memories. Our findings also generate a series of further research questions, of which I will outline a few. First, we were somewhat limited in our ability to draw developmental conclusions from our research findings, as we only included young people in two age groups in our studies. Future studies should, therefore, include a wider age range of participants, particularly across the adolescent years in which development can be turbulent (Blakemore & Choudhury, 2006), and extend up to adulthood. This may more clearly illuminate developmental trends in RIF.

Second, future research could continue to identify what kinds of memory details are vulnerable to being forgotten following selective discussion. For example, the extent to which the information reported in a memory is causally connected has been found to be related to long-term memory recall for children and adolescents (Trabasso, Secco, & van den Broek, 1984). This kind of memory detail may, therefore, also be influenced by selective discussion. In addition, our finding that children who provided more memory details during retrieval practice forgot a greater proportion of their non-discussed memories could be further investigated in future research. For instance, we did not investigate what kinds of memory detail influenced RIF, nor did we investigate whether the amount of memory detail provided at retrieval practice was related to the number of memory details forgotten at the test. By investigating the many facets of autobiographical memories it will be possible to create increasing clarity around the specific impact of selective discussion and draw conclusions about which aspects of memories are vulnerable to being forgotten following selective discussion and which are protected.

Third, our finding that the RIF effect in adolescence differed after a delay of 5 minutes and 1 day indicates the importance of including long-term follow-up tests in order to investigate the enduring effects of selective discussion. Since no other studies investigating RIF for autobiographical memories (as opposed to word pairs or eye-witness stimuli) have

included a delayed test, the design of our study created new insights about how RIF may operate on positive and negative memories over time. We were still limited, however, in our ability to speculate about the long-term impact of selective discussion, as even our long-term delay condition was just 1 day after retrieval practice. Some studies investigating the duration of RIF for different kinds of stimuli have found that it endures for up to 7 days (García-Bajos et al., 2009), and future studies could include recall tests after longer delays in order to more accurately surmise how selective discussion may affect memory recall in the real world.

More generally, our findings that selective discussion leads to RIF for young people's autobiographical memories can be used as a springboard to investigate young people's autobiographical memories using different adaptations of the RIF paradigm. Throughout the thesis the retrieval-practice phase of the RIF paradigm has been referred to as "selective discussion". It should be noted, however, that the paradigm used is limited in its ability to fully replicate the nuances of conversation or discussion of autobiographical memories in the real-world. As previously discussed, the SS-RIF paradigm (Cuc et al., 2007) is a stronger paradigm to more accurately reflect conversations between young people and their parents in experimental conditions. The findings of such studies would, therefore, be more directly applicable to other studies with parents and children that have investigated the benefits of conversation about autobiographical memories.

Final Conclusion

Conversations about autobiographical memories are important for young people's memory development and help them create meaning from their experiences (Nelson & Fivush, 2004). The aim of this research was to investigate the effects of not talking about a selection of memories on young people's ability to recall experiences. Overall, we found that talking about a selection of autobiographical memories at the expense of others impairs young people's ability to recall non-discussed memories that are similar to those discussed.

Not only are these memories less likely to be recalled by young people in future, but they are also recalled with sparser memory detail. In addition, the impact of selective discussion differs development, with the general pattern of findings indicating that younger children's memories are more vulnerable to being forgotten following selective discussion than adolescents' memories.

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Appendix

Appendix A: Study 1 Information and Consent Letter to Parents

Strategies to help children recall everyday experiences

RM #0000022203

September 2015

Dear Parents/Caregivers,

We are conducting a study that is looking at how best to help children recall everyday experiences. We would like to invite your daughter or son to participate, as we are keen to involve children approximately between 8 and 9 years of age. We have the support of your son or daughter's school, and have received ethical approval from the Victoria University's School of Psychology Human Ethics Committee, under delegated authority to the Victoria University of Wellington's Human Ethics Committee.

What is the purpose of this research and why is it important?

- Our research will help us understand how children remember and report everyday emotional experiences. In particular, we are keen to understand the impact of children repeatedly discussing certain events but not others.
- Studies such as this are important because this kind of research has previously only been conducted with adults, so we need more research with children in order to understand how memory develops.

Who is conducting the research?

- This research is being conducted by researchers from the School of Psychology at Victoria University of Wellington. Ruth Glynn, a PhD student, is conducting this study under the supervision of Associate Professor Karen Salmon and Dr Jason Low.

What is involved if you and your child participate in this study?

- Your daughter or son will be seen individually at school, by our researcher. He or she will be asked to complete a task that involves remembering multiple events in response to cue words (such as 'positive', 'negative', 'pleased' or 'sad'). A negative memory may include a time when they argued with a friend while a positive memory may include a time when they won a competition. Your son or daughter will then be asked to recall some of these memories a number of times before being asked to recall all of the memories they initially provided.
- These conversations will be recorded so that they can be accurately transcribed. Audio recordings will be held securely and will be destroyed following transcription. Transcriptions will have all identifying information removed.
- Your child is able to withdraw from the study at any point during their session with the researcher should he or she no longer wish to continue.
- For your information, your son or daughter will receive a small gift, of less than $1 value, as a token of appreciation for taking part in the study.

Privacy and Confidentiality

- Audio recordings will be kept until data is transcribed.
- Consent forms, transcriptions and any identifying data from the study will be kept for five years after publication of the results.
- The data will be coded by numbers and therefore, your son or daughter will never be identified individually.

- The coded data of your child will be securely stored in the laboratory of Dr Karen Salmon and kept for ten years after publication of the results.
- Coded data (that is, data without your son's or daughter's name) may be shared with other competent professionals upon request.

What happens to the information that you provide?

- We may publish the results of the study in a scientific journal, present them at a conference, and include them in our student's theses. For both publication and theses, no individual will be identified in the results.

The results of the study will be available approximately December 2017. A summary of the results will be sent out to you upon completion, if you wish.

If you have any further questions regarding this study, you are most welcome to contact the lead researcher, Ruth Glynn, ph 04 463 8074, or Ruth.Glynn@vuw.ac.nz, or one of the supervisors of this study, Dr Karen Salmon, ph 04 463 9528 or Karen.Salmon@vuw.ac.nz.

If you agree for your child to participate in this study, please return this consent form to your child's teacher.

Thank you for your time in considering participation in this study.

Yours sincerely,

Ruth Glynn

PhD Student, Psychology

Karen Salmon, PhD., Dip.Clin.Psych

Associate Professor in Psychology

Dr Jason Low

Senior Lecturer in Psychology

Statement of Parental Consent

I have read all the information above and have asked any questions relating to this study, which have been answered satisfactorily.

I consent to the participation of my child in this research. I understand that:

1. My child can withdraw from this study at any point during their session with the researcher,
2. All identifying data will remain confidential and will be destroyed after 5 years,
3. The data base, with identifying data removed, will kept up to 10 years after publication,
4. Conversations between my child and the researcher will be audio recorded and the recording will be kept until the data has been transcribed.

Parents name: .....

Child's name: .....

Child's date of birth: .....

Mailing address: .....

Email address: .....

Phone number: .....

Signature: .....

Date: .....

I would like the report describing the results of the study sent to me by:

□ post, or

□ email

Appendix B: Study 1 and 3 Data Collection Script

Introduction

Hello, my name is Ruth and I am from Victoria University of Wellington. I'm here today to talk to you about your memories about some of the everyday things that have happened to you in your life. I'm going to ask you about them because I'm interested in the way kids remember things that have happened to them. Your parents have said that it's fine for you to take part in this activity but if you want to stop at any time that's ok, I can take you back to your class. Is that OK? Do you have any questions for me before we start? I'm going to record our conversation so that I can listen to it again later and I don't have to worry about remembering everything now.

Demographics

Before we start I'm just going to ask you to fill out this form with a couple of general questions about yourself. First can you please tick the box that matches your gender. Next can you please tick the box that matches your ethnicity. This could be based on where you are from, where your parents and family are from, or what culture you identify with the most. Sometimes we might fit more than one of these but try to pick the one that you identify with most strongly. If you don't think any of these options match your ethnicity tick the other box and write down your answer.

Generation

I'm going to ask you to tell me about some memories that the words '*positive*' and '*negative*' reminds you of. Positive means something that was good, for example if you won a competition. Negative means something that was hard, for example if you have an argument with your friend. Your memories can be about any area in your life, for example at home, at school or with your friends but each memory should be about a different event. Do you have

any questions? I am going to write down your memories because we're going to talk more about them later.

Please tell me about a *positive* memory. [Prompt] Is there anything else you can tell me about that?

How does the memory make you feel? Look at these pictures. The really smiley face means the memory makes you feel really happy or positive. The next smiley face means the memory makes you feel a little bit happy or positive. The straight face means the memory doesn't make you feel positive or negative. This sad face means the memory makes you feel a little bit sad or negative. And this really sad face means the memory makes you feel really sad or negative. Which one of these faces matches how the memory makes you feel?

Lastly, I'd like you to come up with 1 word to sum up this memory. Think of this memory as if it were a chapter in a book. If you had to name this chapter with 1 word, what would you call it?

Please tell me about a *negative* memory. [Prompt] Is there anything else you can tell me about that?

[x6 alternating '*positive'* and '*negative'*]

<u>Learning</u>

Now I'm going to read each of your memories back to you again. I am going to say whether the memory was positive or negative, read the chapter title you gave it and read out everything you told me about the memory. I want you to listen carefully to which memory matches each chapter title, because I'm going to ask you about it later.

<u>Retrieval-Practice</u>

Now we are going to do something a bit different. I am going to give you some clues and I want you to tell me the memory that matches up with these clues. Each time I will say whether the memory is *positive* or *negative*, and I'll tell you the chapter title you gave me and

I would like you to tell me the matching memory in as much detail as possible. I'm also going to ask you an extra question about your memories. I might give you the same chapter title more than once. This doesn't mean you were wrong the last time, I just want you to tell me it again.

[3 memories will be selected of the same emotional valence (*positive* or *negative*). Each selected memory will be repeated 3 times. In the first retrieval-practice, participants will be asked, "What were the causes of the event?"; in the second retrieval-practice, they will be asked, "What were the consequences of the event?"; and in the final retrieval-practice, they will be asked, "Why was the event important?"]

Distractor

Let's take a break from talking about memories and do something totally different. Here is a picture of X. I'd like you to copy it as carefully as you can into this grid, try and make it the same size by using the boxes to help you.

Test

For the last activity we are going to do today, I would like you to tell me all the memories you told me at the start. Some were positive memories and others were negative memories. Remember that positive memories are good or easy memories and negative memories are sad or hard memories. Let's start with the positive memories (counterbalance positive/negative). Try to remember as much detail about each memory as you can.

[Prompt] Are there any more positive memories you can remember?

Let's move on to the negative memories. Again try to remember as much detail as you can.

[Prompt] Are there any more negative memories you can remember?

The very last thing I'd like you to do is tell me something you're looking forward to that's coming up soon.

Debrief

Thanks so much for coming in and helping me today! You've done such a great job in telling me about some of your memories. Now I'm going to tell you what happens next. When we finish at [School Name] today we are going to take all of your answers back to the university. Your answers will become part of a big group of answers that we use to explore how kids remember things. When we finish this study we will send a letter to your school and your parents. This letter will tell you about what we have learned about how kids think and remember things. This letter will not tell your parents or teachers how you did because your answers will be combined with other kids answers to create a big group that we will explore.

Do you have any questions about what you did today or what will happen in the future?

You can take one of these gifts as a thank you for taking part and helping me today.

Thanks for helping us! I will take you back to class now.

Appendix C: Study 2 Additional Data Collection Script

Session 1 Debrief

Thanks so much for coming in and helping me today! You've done such a great job in telling me about some of your memories. I am going to come back tomorrow and ask you again about your memories, if that's ok? After that, I'll tell you what is going to happen to all these memories once I go back to the university.

Session 2 (following day)

Hello, do you remember me from yesterday? I've come back to ask you again about your memories, and to see what you can remember from our conversation yesterday.

I would like you to tell me all the memories you told me at the start of yesterday's conversation. Some were positive memories and others were negative memories. Remember that positive memories are good or easy memories and negative memories are sad or hard memories. Let's start with the positive memories (counterbalance positive/negative). Try to remember as much detail about each memory as you can.

[Prompt] Are there any more positive memories you can remember?

Let's move on to the negative memories. Again try to remember as much detail as you can.

[Prompt] Are there any more negative memories you can remember?

The very last thing I'd like you to do is tell me again about the thing you're looking forward to that's coming up soon.

Debrief

Thank you so much for talking to me again today. Now I'm going to tell you what happens next. When we finish at [School Name] today we are going to take all of your answers back to the university. Your answers will become part of a big group of answers that we use to explore how kids remember things. When we finish this study we will send a letter to your school and your parents. This letter will tell you about what we have learned about how kids

think and remember things. This letter will not tell your parents or teachers how you did because your answers will be combined with other kids answers to create a big group that we will explore.

Do you have any questions about what you did today or what will happen in the future?

You can take one of these gifts as a thank you for taking part and helping me today.

Thanks for helping us! I will take you back to class now.

Appendix D: Narrative Coherence Coding Scheme

Adapted from Reese et al., 2011

Contextual Coherence

Context: Orienting the narrative in time and space

Level 0: No information about time or location is provided

Example: "Winning cross country. It was nice crossing the finish line first"

Level 1: Partial information is provided; there is mention of *either* time *or* location at any level of specificity

Examples:

*"When I saw my friends fight on the **back field**"*

*"When my sister was born. **I was only 3** and I was staring at the little thing inside"*

NOTE: General time information includes: "I was little", "one day", "a long time ago", "my birthday", "Christmas", "summer", "school holidays", "last week", "first time", "in the morning", "first day"

Specific time information includes: "my 7th birthday", "25th March 2014", "last Monday", "last Christmas", "this morning" – must locate the narrative in a *specific* time

General location information includes: "the movies", "the beach", "competition", "soccer game", "the plane", "came over", "came to stay", "the pools", "the fare", "underwater", can sometimes be considered an event (e.g. competition, sports game, fare, etc.)

Specific location information includes: "home", "School", "New Plymouth", "England", "my room", "the aquatic centre", "megabounce"

Level 2: Both time and place are mentioned but no more than one dimension is specific

Examples:

*"When my Nana and Poppa **came to stay** on **Friday**. They came when I was playing cricket and they saw me hit a four"*

*"The **first time** at **school**. People helped me look around and there was 3 children that I wanted to play with and they would be my friends one day."*

NOTE: See above for examples of general and specific time/location

Level 3: Both time and place are mentioned and both are specific

Examples:

*"When my mum and dad said we were going to **China** to try and find my real mum and dad. It was meant to be **June 25th** but it had to be postponed for the next year but now it's going to be in December."*

*"When we went to **Australia last Christmas** and we went to my **Dad's brother's house** and my **Dad's friend's house** for Christmas. We went in an aeroplane and in the middle of the night I heard something like Santa."*

Chronological Coherence

Chronology: Relating components along a timeline

Level 0: Narrative consists of a list of actions with no information about temporal order. No identifiable timeline

Example: "When we were at the beach. We were picking up shells and swimming in the water."

Level 1: Narrative contains one chronological sequence such that 2 events can be placed on a timeline in relation to one another.

Examples:

*"My friend **after our netball game** invited me to megabounce and we were there for 1 hour or 2 hours I'm not sure and we played the whole time we had lots of fun."*

*"When I dropped a cup and it smashed and I was really nervous that my mum was going to give me a big growl. **At the end**, she said that it's alright but try not to do that next time."*

NOTE: Narrative sequences could be linked with "then", "so", "after", "before", "at the start", "at the end" or could be separate sentences. Child must explicitly state the order of the events – order must not be inferred by the reader.

Level 2: Narrative contains two or more chronological sequences but less than 75% of relevant actions can be placed on a timeline. It is not possible to reliably order the entire story from start to finish with confidence.

Examples:

*"When my brother got mad at me because we were just playing something outside he wanted to play soccer but I wanted to do something else **and then he got mad**. **So he went inside** to play with animals."*

Level 3: Naïve listener can order almost all (over 75%) of relevant actions. Speaker may deviate from the timeline but then repair the temporal order.

Example:

*"Last Friday at school I had to go to a picnic and we had to leave at lunch **and then** my teacher was making a game of Manu Samoa versus All Blacks and I really wanted to play it but I couldn't because I had to leave **and then** I told Mrs R that if I could stay to play the game **and** she said no **and then** I said it again **and then** I got my bag and I was stomping my feet with anger and frustration."*

<u>Thematic Coherence</u>

Theme: Maintaining and elaborating on topics

Level 0: The narrative is substantially off-topic and/or characterised by multiple digressions that make the topic difficult to identify. No attempt to repair digressions. Narrative is more a list of semantic facts rather than a flowing narrative.

Examples:

"I really like enjoying going down to Motueka to see my father because ***my mum and my father got divorced when I was really young so I don't get to see my dad very often*** *so I really like it because we live next to a river and sometimes, on a hot day we go together with my brother and sister and we jump off the bridge.* ***But I don't live with my brother and sister as well because they live with my dad****."*

*"****My mum tries to make us happy*** *because* ***she doesn't like us to be mean to her*** *and* ***we try to listen to her*** *and she gets really sad but we try to cheer her up and she gets really happy about it because* ***she's not with her mum and dad*** *and we always write a card to her and help with dinner and bring her flowers and maybe make her a coffee, make her some toast for breakfast in the morning we'll bring it into her room if she's feeling sad. And* ***she tries to work hard to get money*** *because* ***she doesn't really get a lot of money for her work she only get 7 dollars an hour so she gets 72 dollars a day but my stepdad he's the boss of his work so he gets more money so, his money is for our hot water and food and mum just gets a little bit of money and her food****"*

Level 1: A topic is identifiable and most of the statements relate to it. The narrative does not contain any elaborations.

Examples:

"When I went to Rarotonga. We stayed at a resort right near the beach. We went snorkelling."

Level 2: All the above and narrative contains ONE explicit causal link or elaboration. Elaboration may be a personal evaluation (e.g. "it was fun") or reactions of self/others.

NOTE: Examples of explicit causal links: *'because'*, *'the reason that happened was…"* (NOT 'So')

Examples of personal evaluations: *it was fun/gross, I liked it*

Examples of reactions of self/others*: I/they wanted, I/they was/were surprised/happy/angry*

Also include emotional behaviour e.g. laugh, cry (NOT scream)

Do not include background information/comments to the interviewer

Do not include comments such as, *"I like to remember it"*, *"I remember it because it happened recently"*

Examples:

"I liked the last game of soccer we had, ***that was really fun*** *and we got to say goodbye."*

Level 3: The narrative substantially develops the topic. Several instances (more than 1) of explicit causal linkages, and/or personal evaluations, and/or reactions are included.

Level 4: Narratives include all the above and a resolution to the story, or links to other autobiographical experiences including future occurrences, or self-concept or identity. Resolution brings closure and provides new information – could be in the form of a lesson learned.

Examples:

"When we went to Wanganui last year with my Nana and my Poppa and my sister and my brother and my Dad but my Mum had to stay here ***which was quite annoying****. And* ***my favourite bit*** *about it was going to the park cause* ***it just made me think of all the times Mum had taken us there when we were little.*** *And there was a really cool flying fox that* ***I really liked****."*

"Playing my first game of netball when we were at my old school in Lyall Bay in Wellington and I was with my friends, they were all a year above me but when their coach at the time saw how well I could play netball I got picked to be a goal keep. ***I've never played goal keep before****, I was a shooter always, goal attack, that was my position now but* ***it was really nerve-wracking because I've never played with those team members****, we've only had one practice with me in the team when we were about to do that game.* ***So I was goal keep and I found that position quite cool, especially for my first couple of games because I saw how the team played and it was quite good because, this was outdoor netball, and I learned how the team members played together****."*

Appendix E: Internal/External (Experiential) Detail Coding Scheme

(Addis, Wong & Schacter, 2008)

Step One: Isolating and defining the event

Read narrative from start to finish. Identify the *main event:* should be a specific, single event, lasting 1 day or less (approximately – can be lenient with duration), that the subject was personally involved in

NOTE:

Subjects may give more than one event or events that are difficult to define (i.e. non-specific events). It is, therefore, necessary to be clear what the event is before any scoring begins. Details pertaining to the main event are coded differently to details that do not relate to the main event so it is important to identify this from the outset. If the event extends over days or weeks (e.g. a holiday), the scorer must either choose the best time-restricted events or choose the event which is described in most detail i.e. contains the highest number of details according to coding scheme. This may not be clear until the narrative has been coded, in which case the most detailed event becomes the main event, and all other events are external episodic details.

***For turning point narratives we may want to choose the event that is best conceptualised as the specific turning point event, regardless of the amount of detail*

In some cases, it may not be possible to identify a specific main event. Here the narrative should be coded according to the external detail coding scheme (void of internal details).

***Alternatively a third party can identify the main event i.e. someone who is reading the narratives for the first time and was not present during elicitation of narratives*

Step Two: Text segmentation and categorisation

A segment, or detail, is an information unit – a unique occurrence, observation, fact, statement or thought.

NOTE:

A single grammatical clause/sentence may contain multiple details. For each clause/expressed action, consider whether its constituent parts convey additional information. If so, the parts should be separated and coded as separate segments.

Examples:

"He had an old, brown, fedora" = 3 details. 'Fedora' is different from 'brown fedora', which is also different from 'old brown fedora'

"He jumped off the couch" = 2 details. 'He jumped' can stand-alone and convey information without the addition of 'off the couch'. Conversely, *"he got off the couch"* = 1 detail. 'He got' does not make sense as a stand-alone statement and is not coded as extra detail.

The main categorical distinction for details is either *internal* or *external* to the main event.

INTERNAL DETAILS

Details that pertain directly to the main event, isolated as defined above. These details can be conceptualised as experiential details. Once this has been determined, the detail should be coded as one of the following categories.

NOTE:

Remember the aim of coding is to determine the extent to which the subject is re-experiencing/imagining/engaging with the event they are recalling. Use good theory of mind to get inside the subject's head to determine the correct context for their statements i.e. is it part of the experiential process or external information?

In some cases, it may be difficult to distinguish internal from external details. The rule of thumb in these cases ('benefit of the doubt') is that if a detail could reasonably be

internal it is scored as such. This rule, however, should not be applied to all details that could possibly be internal; only those that could reasonably be internal.

Don't rely too heavily on grammatical tense – present tense could mean they are re-experiencing the event. Go with the most likely interpretation in the context of the whole narrative.

Event Details: Overall, event details describe the unfolding of the story pertaining to the main event. They are usually happenings/actions (e.g. *"I fell down"*), but also include who was there (1 point per name/person/pet up to a maximum of 5 ***may want to remove this if not an issue for many participants***), reactions/emotions in others (but not own thoughts/emotions), the weather, clothing (if relevant to the main story), actions of others, and temporal sequence (information about the sequence of events, e.g. *"Mary came later than Sam"*, where 'Mary came' is a stand-alone event detail and 'later than Sam' is additional event informational).

NOTE:

If additional qualifying details (e.g. adjectives) are present, these are coded under the same category as the main detail. E.g. *"I was wearing a black t-shirt"* – 'I was wearing a … t-shirt' would be coded as an event detail, so 'black' is coded as an extra event detail.

If an item qualifies to be in another category (e.g. perceptual details), then priority is given to that more specific category. An item cannot be scored as an event detail if it is in another category.

The relationship of the subject to someone else (e.g. *"boyfriend", "sister"*) should be scored as 1 event detail (if person is involved in the main event). If the relationship is stated and the person is named, score as 2 event details. Also *"best friend"* is scored as 2 event details.

Number of detail scores depends on the choice of language used e.g. *"I jumped off the couch"* is coded as 2 details because 'I jumped' is a stand-alone detail, but *"I got off the couch"* is coded as 1 detail because 'I got' is not a stand-alone detail.

Quantities of objects are scored as 1 extra detail regardless of how many there were e.g. *"There were 2 chairs"* is scored as 2 details, *"There were 100 chairs"* is also scored as 2 details.

Place Details: Any information that involves localisation in space, including countries, bodies of water, provinces, cities, streets, buildings, rooms and localisations within a room. Also includes objects in some contexts e.g. *"In bed", "on an aeroplane", "in the car"*

Time Details: Must locate the event in time. Life epoch (*"My twenties"*), year season, month, date, day of week, time of day or clock time.

NOTE:

It has been argued that it is not possible to re-experience a given point in time without some related episodic thought, feeling, or other detail. Therefore, when scoring time information, people should not be penalised for making inferences (which are usually coded as 'other details'), because this is the normal way to figure out when something occurred. E.g. *"the day before my birthday".*

Perceptual Details: Include auditory, olfactory, tactile/pain, taste, visual details.

Visual (but non-spatial information): object details, colours, clothes. In the case of objects, it may be difficult to distinguish between a perceptual and an event detail. Objects that are directly involved in the unfolding of an event are considered event details (e.g. *"We lit the candles"*) whereas objects that are part of the visual landscape are considered visual details (e.g. *"There were candles lit everywhere"* = 2 perceptual details, 'there were candles lit' + 'everywhere).

Duration: E.g. *"We were there for 20 minutes", "It took a long time"*

Spatial orientation: Details about positions, distances, and orientations in allocentric/egocentric space e.g. one's own orientation in space

Emotions/Thought Details: Any detail that pertains to the mental state of the subject at the time of the event. These include feeling states, opinions, expectations, beliefs. Thoughts expressed in retrospect (either at the time of the interview or at any time after the event occurred. E.g. *"I found out later I was wrong"*) are coded as external details. Beliefs or opinions that are long-standing and not specific to the event (e.g. *"I never believed in ghosts"*) are also external and coded as semantic details. Inferences about other people's mental state (e.g. *"She was sad"*) are considered event details unless these inferences reflect the subject's own mental state at the time (e.g. *"I thought he was angry with me"*), in which case they are internal thought details.

NOTE:

Subject must explicitly state their thought/feeling occurred in retrospect to be coded as an external detail. E.g. *"Later I realised", "now I know"*. If in doubt, code as internal.

For AMT narratives, do not code *"I felt happy when"* as this is a generic response to the task instruction

If a feeling is followed by the cause or target of the feeling (e.g. *"I was happy that he came over"*) then score as 2 details, because 'I was happy' is a stand-alone comment and more information is provided by describing the reason

EXTERNAL DETAILS

Events/details or factual (semantic) information that are not part of the main event. These can include the following:

Semantic Details: Involve general knowledge or facts. They can represent general knowledge (e.g. *"Paris is the capital of France"*) or be specific to the person (e.g. *"I always*

hated yams", "I worked as an engineer"). In general, details that reflect a long-standing state of being or without a clear beginning or end are considered semantic.

NOTE:

The difference between semantic and other types of details can depend on the context. E.g. the fact 'Paris fell to the Germans' would be semantic if it is described as a historical fact (e.g. *"We couldn't go to Paris because it was in German hands"*) or an event details (e.g. *"We watched in disbelief as Paris fell to the Germans"*).

Semantic information can be 'brought in' to episodic recollection (and scored as internal detail) if it becomes an integral aspect of the episode. E.g. *"Arizona is hot"* is semantic but "*Arizona was hot when we went there"* is episodic (perceptual detail).

The richness of the description is independent of the episodic/semantic distinction, i.e. very richly described factual information is still semantic and impoverished, minimal details can still be episodic.

Repetitions: An unsolicited repetition of prior information-containing detail. It doesn't have to be a verbatim repetition but should not add any new information to the prior detail (e.g. *"I hoped for the best. I kept my fingers crossed.*). Score all repetitions, even if they are part of normal discourse, except for repetitions that are clearly prompted by the examiner, which may occur if the examiner asks additional probes or queries a detail previously given.

NOTE:

Repetitions must convey information, as opposed to words that are repeated. E.g. *"and stuff"* may be repeated but it doesn't contain any information so it is not coded as a repetition.

Only score repetitions when they convey the same information as an earlier detail e.g. *"They liked what I did"* conveys the same information as *"They liked my work"* but *"They really liked me"* is not the same as *"They were happy with my work"*.

Other Details: Details that do not reflect recollection and do not fit into other categories. Includes meta-cognitive statements (e.g. *"Let me see if I can remember that"*), editorialising (e.g. "*That doesn't matter", "That's amazing"*), inferences (e.g. *"I must have been wearing a coat because it was winter"*), comments to the experimenter (e.g. *"Is that alright?", "This is a funny one"*) or other statements that convey verbosity but are not related to the main event. Also includes non-answers e.g. *"I don't remember", "I can't think".*

NOTE:

Do not score an 'other detail' for all utterances – only those that contain information

External Episodic Detail: Episodic events that are secondary to the main episodic event. E.g. if the main event is the birth of their first child, but subject also talks about going to the pharmacy to buy prenatal vitamins a few months before.

NOTE:

These details can later be broken down into the internal detail codes if required. E.g. External Event Detail, External Place Detail etc.

Only code second episodic detail if it is related to the first. If subject has listed 2 or more completely different specific episodic memories, only code the first response (as per AMT guidelines).

It is sometimes hard to distinguish between external episodic detail and semantic detail. In these cases, apply the benefit of the doubt rule and lean towards external episodic detail.

External Generic Events/Routines: Details that refer to repeated/routine events (but are not general knowledge). E.g. *"I always go to the dairy down the road"*

NOTE:

If a memory doesn't contain any specific/episodic elements and it is not possible to identify the main event, it is likely to fall under this category.

OTHER CODING RULES

Dialogue: Whether the dialogue is internal (thoughts) or external (speech), each statement/thought represents one detail and is therefore not further segmented. E.g. *"I felt ..."* or, *"She said '..."* are both scored as 1 detail

Negative events: The absence or failure of something to occur (e.g. *"Bob wasn't there"*) are still scoreable, as they reflect the subject's recollection

Missing information: Do not give credit for information that is not there. E.g. *"We went to a place where we could swim with dolphins"* contains one descriptive event detail, but the actual location is not mentioned so it is not scored under place detail. The place is implied but it is not scored until it is mentioned. This rule also applies if the subject has forgotten the name of the place e.g. *"A place with water you can swim in and sand you can sit on"* is clearly a beach but the description of the place is not scored. ***May not apply to our sample as children/adolescents may not know the name of the place, rather than forgotten the name of the place***.*

Fragmented sentences: Scoring of fragmented sentences should allow for natural speech patterns even when they do not appear fluent in the transcription. The scorer should attempt to interpret fragmented sentences in a way that would be obvious to others. I.e. one detail may be interrupted by another detail and continue on afterwards.

The key is to BE CONSISTENT between narratives/subjects. Segmentation of details should be consistent regardless of whether the details are internal or external.